

# Service Manual

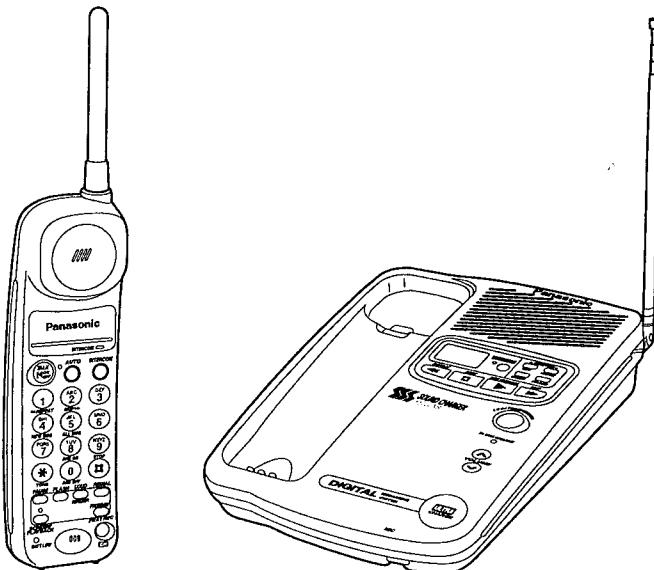


Cordless Answering System

Telephone Equipment

**KX-TCM416SAB****Black Version**

(for South Africa)



(Handset)

(Base Unit)

## ■ SPECIFICATIONS

### General

Modulation:	FM, 5 kHz Deviation	Memory Capacity:	10 telephone numbers, up to 16 digits per station
Frequency Stability:	±2.5 kHz		
Dial Type:	Tone (DTMF)/Pulse	<b>Answering system</b>	
Redial:	Last dialed number at first time the Redial button is pressed on Talk mode	Greeting Message and Incoming Message:	Full digital recording Total recording time, 16 minutes
Pause:	3.5 seconds per pause		

	Base Unit	Handset
Power Source: (Receiver Section)	AC adaptor KX-A11BS1FL1 (DC 12 V)	Built-in rechargeable Ni-Cd battery (PQXA36ASVC)
Receiving Frequency:	7 channels within 49.6 to 49.9 MHz	7 channels within 46.6 to 46.9 MHz
Adjacent Channel Rejection:	40 dB	40 dB
Sensitivity: (Transmitter Section)	1dBµV for 20 dB S/N	2 dBµV for 20 dB S/N
Transmitting Frequency:	7 channels within 46.6 to 46.9 MHz	7 channels within 49.6 to 49.9 MHz
Jacks:	DC IN, Telephone line	
Antenna:	Telescopic	Rubber Flexible
Speaker:	2" (6.5 cm) PM dynamic	1 <sup>3</sup> / <sub>16</sub> " (3 cm) ceramic
Microphone:	Condenser microphone	Condenser microphone
Dimensions (H×W×D):	2 <sup>5</sup> / <sub>16</sub> "×6 <sup>5</sup> / <sub>16</sub> "×9" (59×160×229 mm)	11 <sup>7</sup> / <sub>8</sub> "×2 <sup>5</sup> / <sub>32</sub> "×1 <sup>23</sup> / <sub>32</sub> " (302×55×44 mm)
Weight:	1.3 lb (610 g)	0.53 lb (240 g) with battery

Design and specifications are subject to change without notice.

**Panasonic**

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## **WARNING**

This service information is designed for experienced repair technicians only and is not designed for use by the general public.  
 It does not contain warnings or cautions to advise non-technical individuals of potential dangers in attempting to service a product.  
 Products powered by electricity should be serviced or repaired only by experienced professional technicians.  
 Any attempt to service or repair the product or products dealt with in this service information by anyone else could result in serious injury or death.

When you mention the serial number, write down all 11 digits. The serial number may be found on the label affixed to the bottom of the unit.

## **FOR SERVICE TECHNICIANS**

ICs and LSIs are vulnerable to static electricity.

**When repairing, the following precautions will help prevent recurring malfunctions.**

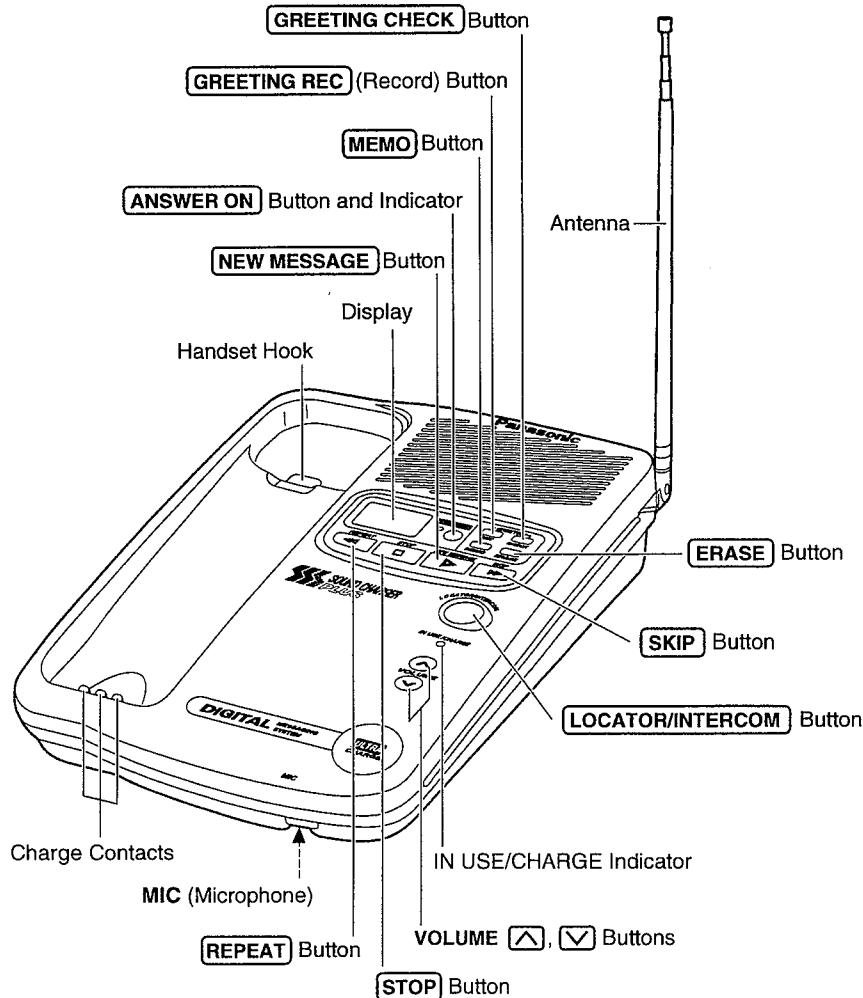
1. Cover plastic parts boxes with aluminum foil.
2. Ground the soldering irons.
3. Use a conductive mat on worktable.
4. Do not grasp IC or LSI pins with bare fingers.

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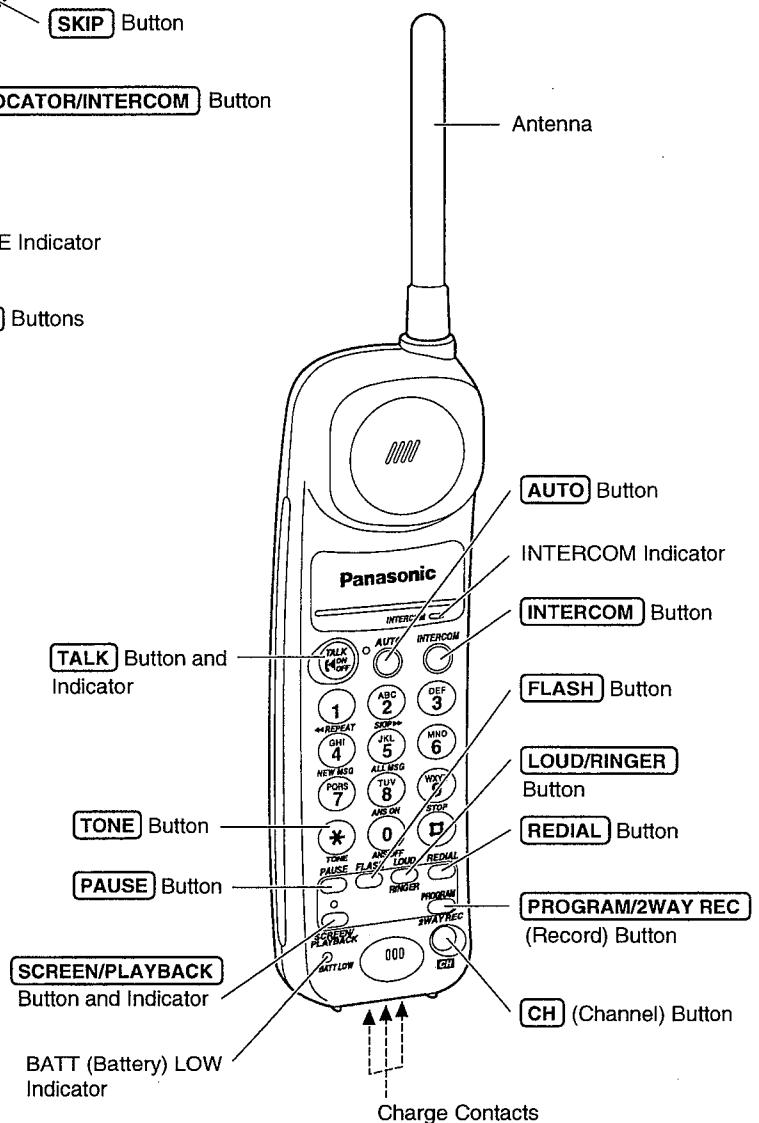
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# LOCATION OF CONTROLS

## Base Unit



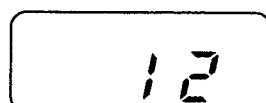
## Handset



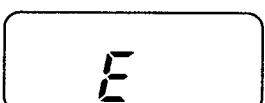
**Base unit Display**



The clock needs adjusting.



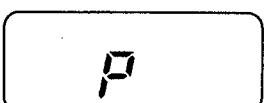
12 messages have been recorded.



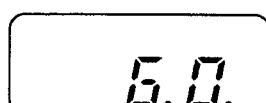
Your message was not recorded correctly.  
Record it again.



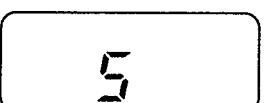
Memory is full. Erase some or all  
of the messages.



The unit is in programming mode.



The recording time is set to  
"greeting only".



The speaker volume level is set to "5".  
You can select 9 levels (0-8)  
while using the answering system.

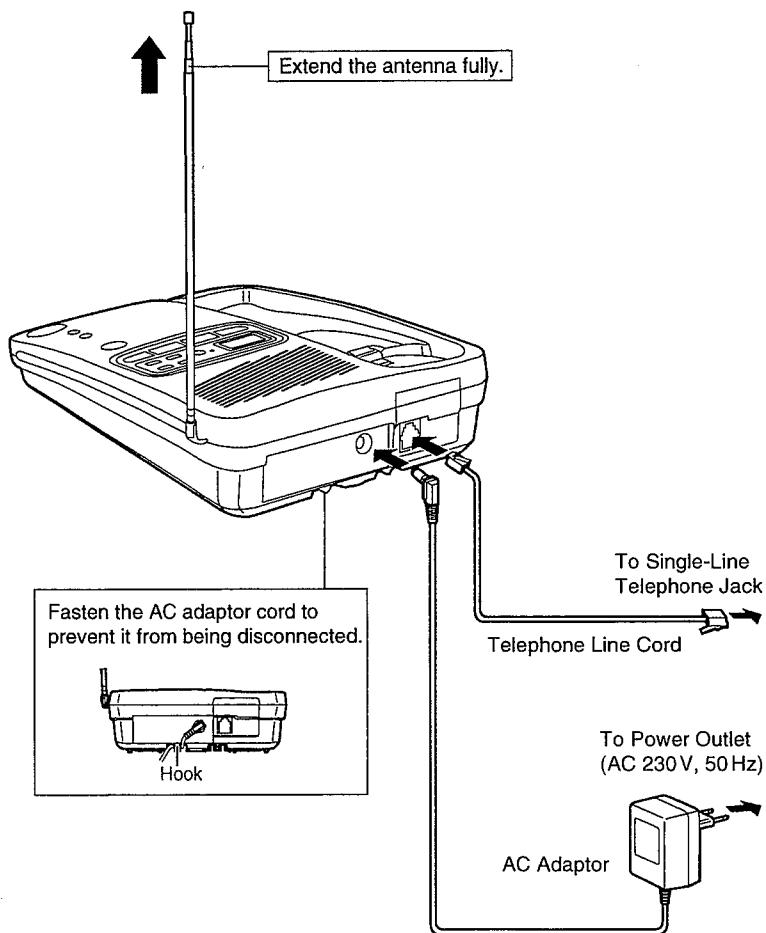
## BATTERY INFORMATION

If your Panasonic battery is fully charged;

While in use (TALK)	Up to about 8 hours
While not in use (Stand-By)	Up to about 30 days

- Battery life may vary depending on usage conditions and ambient temperature.
- **Clean the handset and the base unit charge contacts with a soft dry cloth once a month. Clean more often if the unit is subject to grease, dust or high humidity.** If not, the battery may not charge properly.
- If the battery is fully charged, you do not have to place the handset on the base unit until the BATT LOW indicator flashes. This will maximize the battery life.
- The battery cannot be overcharged.

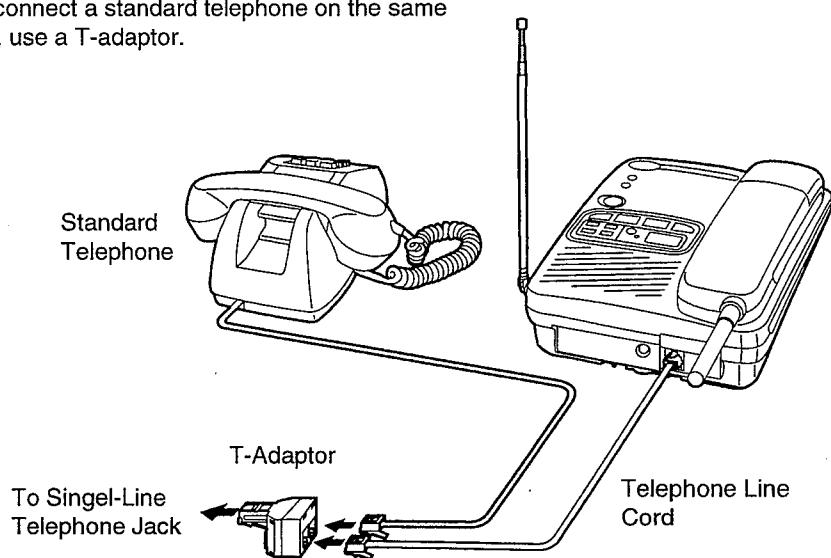
## CONNECTION



- USE ONLY WITH Panasonic AC ADAPTOR KX-A11BS1FL1.
- The AC adaptor must remain connected at all times.  
(It is normal for the adaptor to feel warm during use.)

## Adding Another Phone

This unit will not function during a power failure.  
To connect a standard telephone on the same  
line, use a T-adaptor.



## OPERATIONS

### Selecting the Dialing Mode

You can program the dialing mode by using the handset near the base unit. If you have touch tone service, set to TONE. If rotary or pulse service is used, set to PULSE. Your phone comes from the factory set to TONE.

**1** Press [PROGRAM/2WAY REC].

- The [AUTO] indicator flashes.

**2** Press [AUTO].

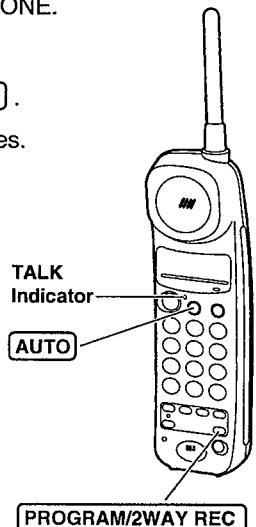
**3** To select PULSE,

press [#] Twice.

OR

To select TONE,

press [\*] Twice.



**4** When finished,

Press [PROGRAM/2WAY REC].

- A confirmation tone sounds.\*

- To cancel during programming, press [PROGRAM/2WAY REC], then start from step 1.

- If 3 beeps sound during programming, a wrong key was pressed.

Restart from step 1.

**\* What the confirmation tone means**

1 beep: The mode is different from the previously selected one.

2 beeps: The mode is the same as the previously selected one.

If a power failure occurs, the mode will return to the factory preset (TONE). Reprogram if necessary.

### Greeting Message

You can record a personal greeting message. If not, one of two pre-recorded greetings will be played when a call is received.

All messages (greeting, incoming, memo, etc.) are stored in digital memory. The total recording time is about 16 minutes. We recommend you record a brief greeting message in order to leave more time for recording new messages.

#### To record a greeting message

**1** Press [GREETING REC] to start the recording mode.

- "Press RECORD again to record greeting." is heard.

**2** Within 5 seconds, press [GREETING REC] again to record your greeting.

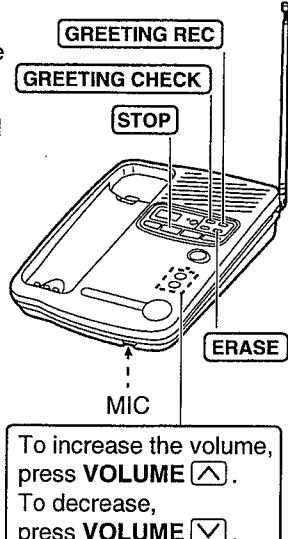
- A long beep sounds.

**3** After the long beep, talk clearly about 20cm away from the MIC (microphone).

- The display shows the elapsed recording time.

**4** When finished, press [STOP].

- To check the recorded greeting, press [GREETING CHECK].
- To change the message, repeat from step 1.



To increase the volume, press VOLUME ▲.

To decrease, press VOLUME ▼.

#### Greeting message sample

"Hello, this is (your name and/or number). Sorry I cannot take your call. Please leave a message after the beep. Thank you."

#### To erase the recorded greeting message

Press [GREETING CHECK] → press [ERASE] while the message is being played.

- The unit will answer a call with a pre-recorded greeting.

#### Pre-recorded greeting message

If you do not record a greeting message, one of the following two messages will be played when a call is received depending on the caller's recording time.

**To check the pre-recorded greeting, press [GREETING CHECK].**

- A pre-recorded greeting will be played as below.
- When the recording time is set to "1 minute" or "unlimited";  
"Hello, we are not available now. Please leave your name and phone number after the beep. We will return your call."
- When the recording time is set to "greeting only";  
"Hello, we are not available now. Please call again. Thank you for your call."

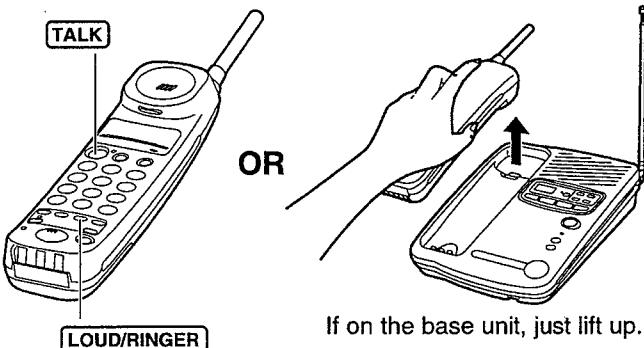
#### Flash Memory Message Backup

Messages are stored indefinitely on a "flash memory" IC chip — even if a power failure occurs. All of the messages are saved until you erase them.

## Answering Calls

If the handset is off the base unit, press **TALK**.

- You can also answer a call by pressing any dialing button **0** to **9**, **\***, or **#** (**-Any Key Talk**).



## Adjusting the handset ringer volume

The TALK indicator light must be off.

- To select **HIGH (preset)** or **LOW**, press **LOUD/RINGER** briefly. (Each time you press the button briefly, the selected volume will ring and the ringer volume will change.)
- To turn the ringer **OFF**, press and hold **LOUD/RINGER** until 2 beeps sound.
- To turn the ringer **ON**, press **LOUD/RINGER** briefly. The ringer will sound at the **HIGH** level.

## Lighted handset keypad

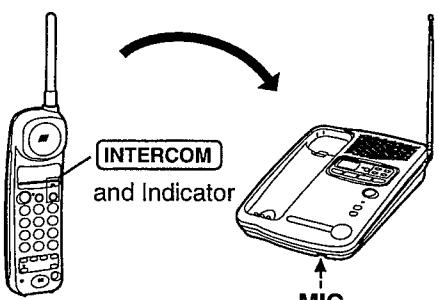
The dialing buttons will light while dialing and flash when a call is received. The lights will go out about 10 seconds after dialing or answering a call.

## Intercom

A 2-way intercom is available between the handset and the base unit.

### Paging the base unit from the handset.

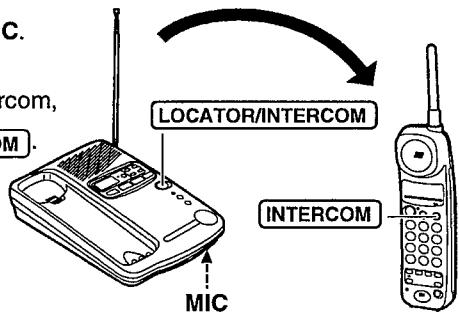
- Handset:  
Press **INTERCOM**.  
Talk to the paged party after the beeps.
  - The indicator lights.
- Base unit:  
When the other party's voice is heard, answer using the **MIC**.
- Handset:  
To end the intercom, press **INTERCOM**.



### Paging the handset from the base unit (Handset locator)

Using this feature, you can locate the handset, if misplaced.

- Base unit:  
Press **LOCATOR/INTERCOM**.
  - The handset beeps for 1 minute.
  - To stop paging, press **LOCATOR/INTERCOM** again.
- Handset:  
Press **INTERCOM** to answer.
- Base unit:  
Talk into the **MIC**.
- Handset:  
To end the intercom,  
press **INTERCOM**.



### During the intercom:

- Intercom calls can only be ended by the handset.
- If two tones sound, an incoming call has been received. To answer, press **TALK**. The intercom is ended.

## Automatic Answering Operation

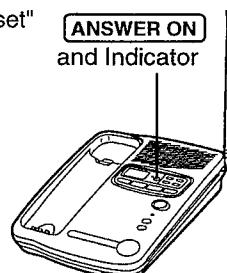
When the unit answers a call, a greeting message is played and the caller's message is recorded.

- The total recording time (including the greeting message) is about 16 minutes. If messages are recorded in noisy rooms, the memory time may be shortened up to 5 minutes.
- A maximum of 64 messages (including the greeting message) can be recorded.

## Setting the Unit to Answer Calls

Press **ANSWER ON** to turn on the answering system.

- The indicator lights and "Answer set" is heard.
- The unit will announce the remaining recording time if it is less than 5 minutes.
- If you hear "Memory full" and the indicator flashes rapidly, erase some or all of the messages.
- If you do not want the unit to answer calls, press **ANSWER ON** to turn the answering system off. The indicator light goes out and "Answer off" is heard.
- You can also turn on the answering system remotely using any phone.



## Monitoring incoming calls

While a call is being recorded, you can monitor it through the speaker. To answer the call, lift the handset off the base unit or press **TALK** on the handset. The unit stops recording.

## DISASSEMBLY INSTRUCTIONS

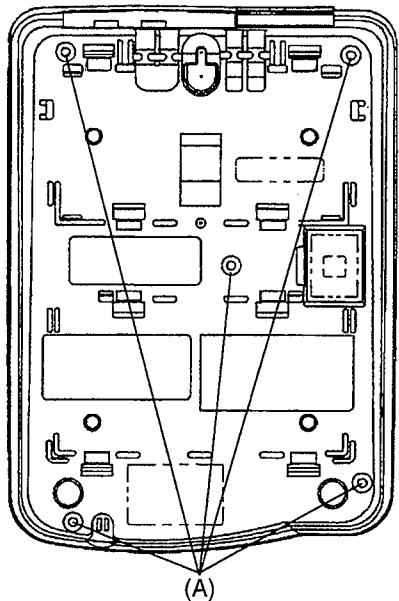


Fig. 1

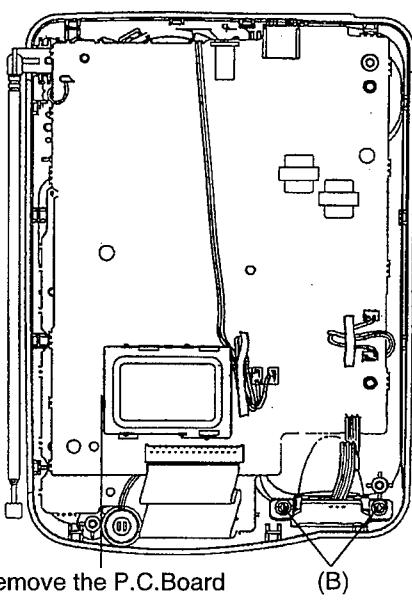
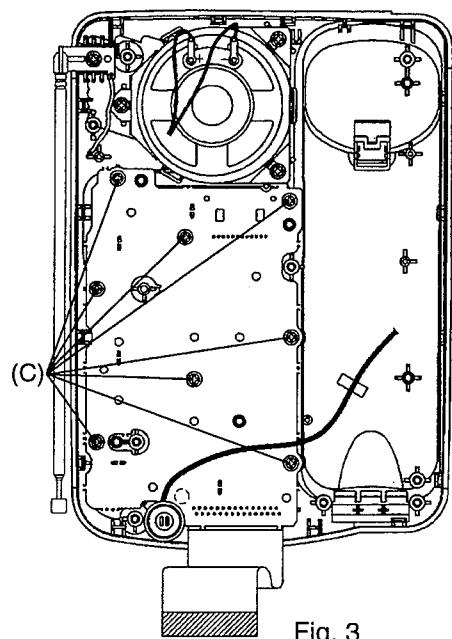
Fig. 2  
Remove the P.C.Board

Fig. 3

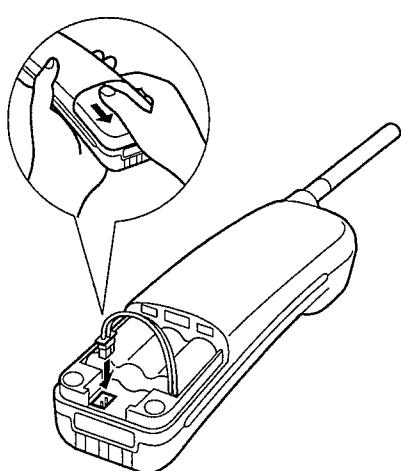


Fig. 4

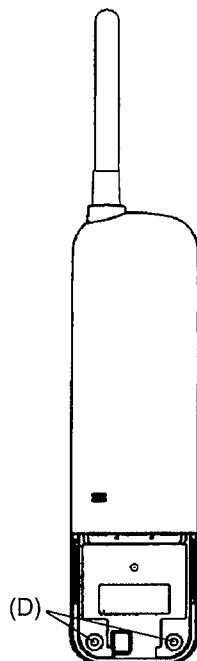


Fig. 5

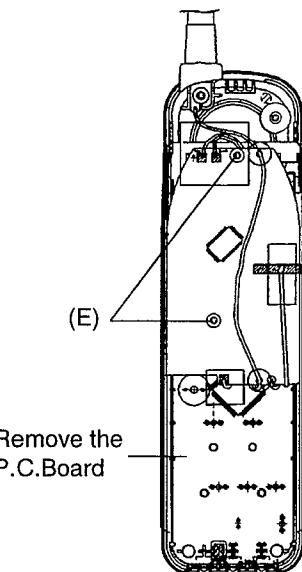


Fig. 6

Ref. No.	Procedure	Shown in Fig.—	To remove—	Remove—
1	1	1	Lower Cabinet	Screws (3×14).....(A)×5
2	1, 2	2	Main Printed Circuit Board and Battery Terminal Board	Screws (3×8).....(B)×2
3	1, 2, 3	3	Operation Printed Circuit Board	Screws (3×8).....(C)×8
4	4, 5	4	Rear Cabinet	Remove the battery compartment cover
5		5		Screws (2.6×14).....(D)×2
6	4~6	6	RF Printed Circuit Board	Screw (2.6×10).....(E)×2

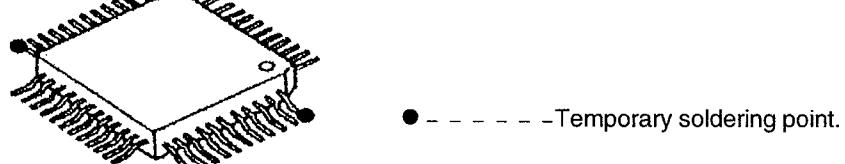
# HOW TO REPLACE FLAT PACKAGE IC

## ■ PREPARATION

- SOLDER - - - - - Sparkle Solder 115A-1, 115B-1  
OR  
Almit Solder KR-19, KR-19RMA
- Soldering iron - - - - - Recommended power consumption will be between 30 W to 40 W.  
Temperature of Copper Rod 662 ± 50 °F (350 ± 10°C)  
  
(An expert may handle 60~80 W iron, but beginner might damage foil by overheating.)
- Flux - - - - - HI115      Specific gravity 0.863  
  
(Original flux will be replaced daily.)

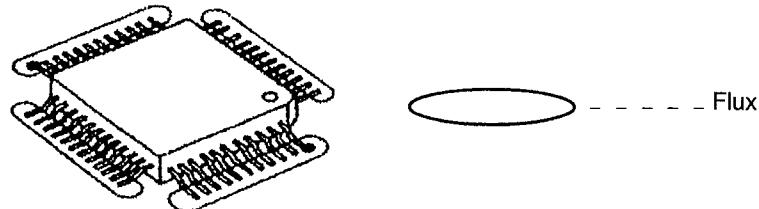
## ■ PROCEDURE

1. Temporary fix FLAT PACKAGE IC by soldering on two marked 2 pins.

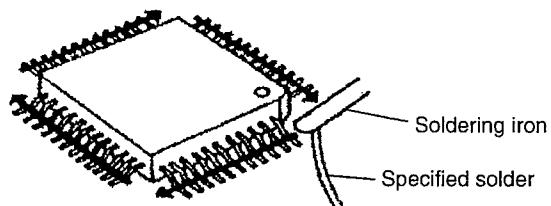


\*Most important matter is accurate setting of IC to the corresponding soldering foil.

2. Apply flux for all pins of FLAT PACKAGE IC.

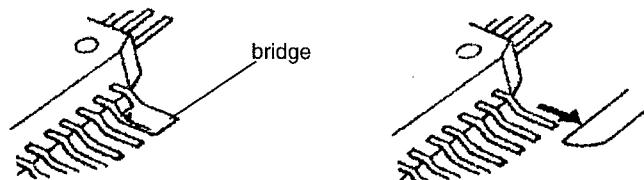


3. Solder employing specified solder to direction of arrow, as sliding the soldering iron.

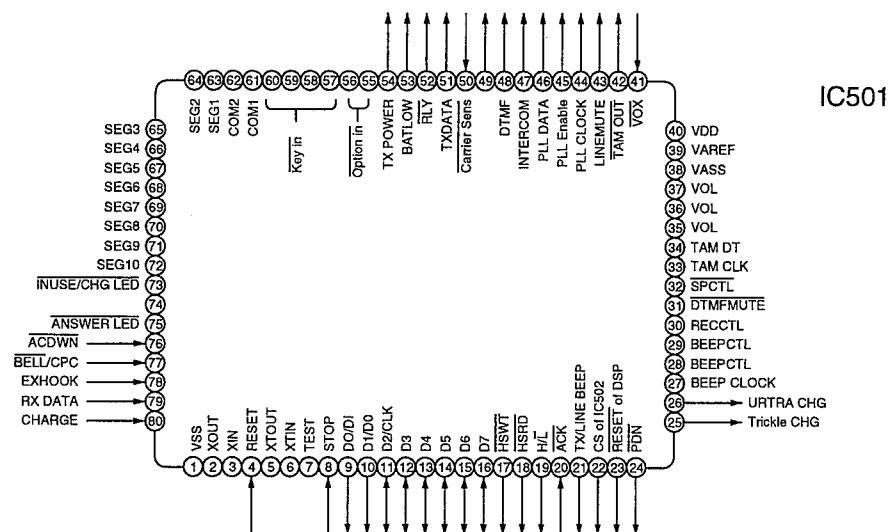


## ■ MODIFICATION PROCEDURE OF BRIDGE

1. Re-solder slightly on bridged portion.
2. Remove remained solder along pins employing soldering iron as shown in below figure.

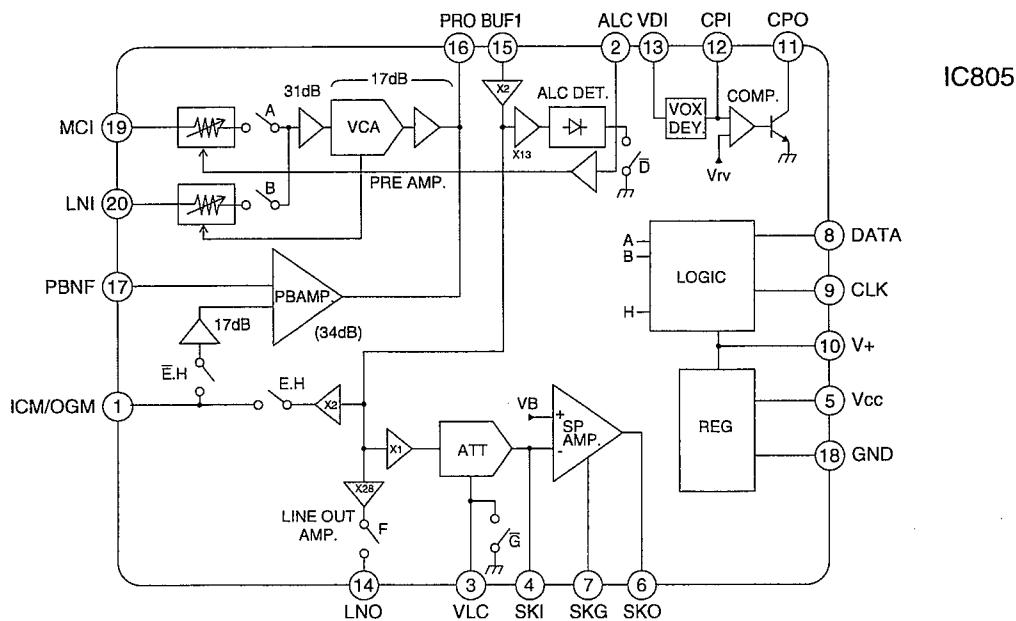


## CPU DATA (BASE UNIT)



Pin No.	Description	I/O	High	High-Z	Low	Pin No.	Description	I/O	High	High-Z	Low
1	VSS	-	-	-	GND	41	VOX	I	-	-	Active
2	XOUT	O	-	-	-	42	TAM OUT	O	MUTE	-	Unmute
3	XIN	I	-	-	-	43	LINEMUTE	O	MUTE	-	Unmute
4	RESET	I	Normal	-	RESET	44	PLL CLOCK	O	(H/L)	-	Normal
5	XTOUT	O	-	-	-	45	PLL Enable	O	Latch	-	Normal
6	XTIN	I	-	-	-	46	PLL DATA	O	(H/L)	-	Normal
7	TEST	I	-	-	GND	47	INTERCOM	O	INTERCOM	-	Normal
8	STOP	I	Normal	-	STOP	48	DTMF	O	-	-	-
9	DO/DI	I/O	DATA	Normal	DATA	49	Not Used	-	-	-	-
10	D1/D0	I/O	DATA	Normal	DATA	50	Carrier Sens	I	Low	-	High
11	D2/CLK	I/O	DATA	Normal	DATA	51	TXDATA	O	1	-	0
12	D3	I/O	DATA	Normal	DATA	52	RLY	O	OFF	-	ON
13	D4	I/O	DATA	Normal	DATA	53	BATLOW	I	Battery	-	Batt Low
14	D5	I/O	DATA	Normal	DATA	54	TX POWER	O	POWER ON	-	POWER OFF
15	D6	I/O	DATA	Normal	DATA	55	Option in	I	DISABLE	-	ENABLE
16	D7	I/O	DATA	Normal	DATA	56	Option in	I	DISABLE	-	ENABLE
17	HSWT	O	-	Write to DSP	-	57	Key in	I	DISABLE	-	ENABLE
18	HSRD	O	-	Read from DSP	-	58	Key in	I	DISABLE	-	ENABLE
19	H/L	O	High byte	-	Low byte	59	Key in	I	DISABLE	-	ENABLE
20	ACK	I	DSP Active	-	DATA RECEPTION OK	60	Key in	I	DISABLE	-	ENABLE
21	TX/LINE BEEP	O	Active	-	Normal	61	COM1	O	COM1 mode	-	COM1 mode
22	CS of IC502	O	ON	-	OFF	62	COM2	O	COM2 mode	-	COM2 mode
23	RESET of DSP	O	RESET	-	NORMAL	63	SEG1	O	-	-	-
24	PDN	O	POWER ON	-	POWER DWN	64	SEG2	O	-	-	-
25	Trickle CHG	O	Trickle	-	Normal	65	SEG3	O	-	-	-
26	ULTRA CHG	O	ULTRA	-	Normal	66	SEG4	O	-	-	-
27	BEEP CLOCK	O	Active	-	Normal	67	SEG5	O	-	-	-
28	BEEPCTL	O	-	High	Low	68	SEG6	O	-	-	-
29	BEEPCTL	O	-	High	Low	69	SEG7	O	-	-	-
30	RECCTL	O	REC MODE	-	Normal	70	SEG8	O	-	-	-
31	DTMFMUTE	O	Unmute	-	MUTE	71	SEG9	O	-	-	-
32	SPCTL	O	Normal	-	SP-Phone	72	SEG10	O	-	-	-
33	TAM CLK	O	-	-	-	73	INUSE/CHG LED	O	-	LED OFF	LED ON
34	TAM DT	O	-	-	-	74	Not Used	-	-	-	-
35	VOL	O	-	High	Low	75	ANSWER LED	O	-	LED OFF	LED ON
36	VOL	O	-	High	Low	76	ACDWN	I	AC	-	AC DOWN
37	VOL	O	-	High	Low	77	BELL/CPC	I	CPC	-	BELL
38	VASS	-	-	-	GND	78	EXHOOK	I	EXHOOK	-	-
39	VAREF	-	VDD	-	-	79	RX DATA	I	1	-	0
40	VDD	-	VDD	-	-	80	CHARGE	I	Charge	-	No Charge

# EXPLANATION OF IC TERMINALS (BASE UNIT)

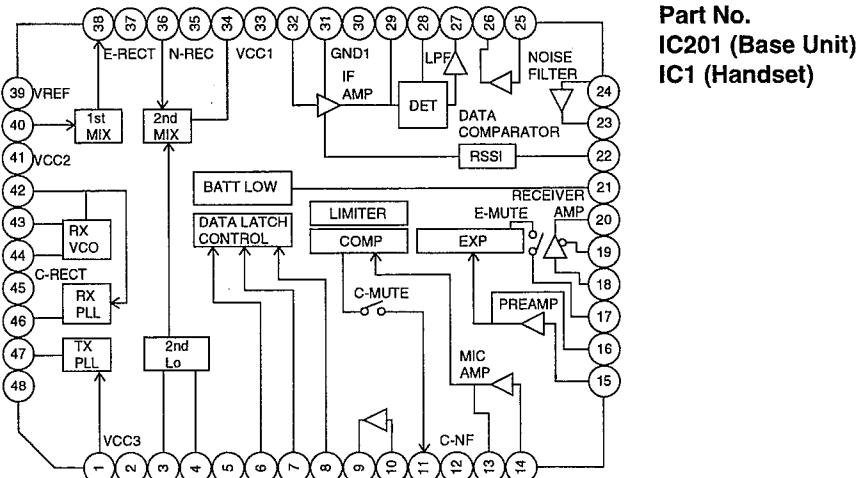


## • Pin Description

Pin No.	Name	Description
1	ICM/OGM	I/O for ICM head. I/O impedance is approximately 20 kohm that keeps high impedance sufficient for head load.
2	ALC	For connection to CR for ALC detection smoothing. The time constant of the CR decides the recovery time. The attack time depends on the values of C and internal resistance (approx. 8.5 kohm).
3	VLC	Volume control input. The speaker output controlled by changing the volume resistance between this pin and GND.
4	SKI	Reverse input of the speaker amplifier. The gain and frequency characteristics are set by external CR. Non-reverse input is biased by internal power source (approx. 1/2 Vcc).
5	Vcc	Power source of IC except LOGIC part.
6	SKO	Output of speaker amplifier. Sets frequency characteristics by connecting to Pin 4 in parallel. Speaker's impedance is normally 30 ohms.
7	SKG	GND speaker amplifier output part.
8	DATA	Input of control data for mute mode. For serial synchronous input with clock signal.
9	CLK	Clock input for data input synchronization. Controls shift register by data bit at fall, and latches by reading data at rise.
10	V+	5.4 V stable output to supply bias with microphone.
11	CPO	output of comparator. Connected to open-collector of NPN transistor.
12	CPI	Input of VOX detector comparator. Compares internal reference voltage with gained voltage, and has a bit hysteresis characteristics.
13	VDI	Input of VOX detector.
14	LNO	Output of buffer amplifier for line output. Current amplifier.

**KX-TCM416SAB**

Pin No.	Name	Description
15	BUFI	Inputs of Recording amplifier, line output amplifier, speaker amplifier, and ALC detector. These are input after voltage/radio conversion by CR between this pin and pin 16.
16	PRO	Output of MIC/LINE amplifier and playback amplifier.
17	PBNF	Reverse input of playback amplifier for controlling frequency characteristics. The CR network between this pin and Pins 16 and 18 set frequency and gain.
18	GND	GND for all ICs except speaker amplifier.
19	MCI	Input of microphone amplifier. The input resistance is normally 33 kohms.
20	LNI	Input of line amplifier. The same configuration as MCI.

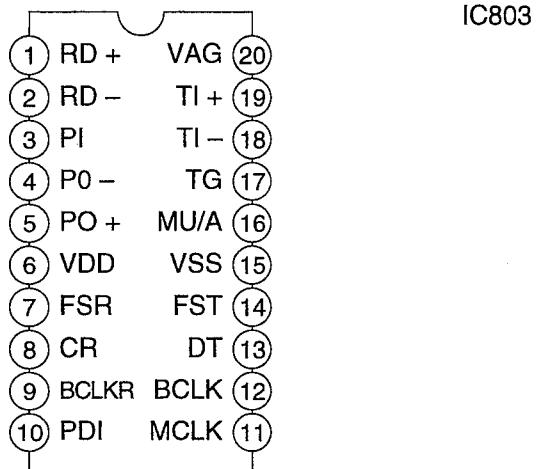


**Part No.**  
IC201 (Base Unit)  
IC1 (Handset)

Pin No.	Name	Description
1	TX-IN	Input terminal of TX-VCO
2	VCC3	Power supply terminal
3	LO-1	Local oscillator input output terminal
4	LO-2	Colpitts oscillating circuit consists of internal emitter follower circuit and external crystal. Additionally external injection through pin 3 is available.
5	SIG OUT	Detection signal output terminal, which is an open drain.
6	CLK	Clock input terminal
7	DATA	Serial data input terminal
8	STB	Strobe signal input terminal
9	FIL-OUT	Filter amplifier output terminal
10	FIL-IN	Filter amplifier input terminal
11	COMP-OUT	Compressor output
12	C-NF	SUM amplifier T-shape feed-back circuit consists of external compressor.
13	MIC-OUT	Mic amplifier output, which is connected to SUM amplifier input directly.
14	MIC-IN	Mic amplifier input terminal
15	PRE-IN	Preamplifier inverting input terminal
16	PRE-OUT	Preamplifier output terminal, which is connected to expander directly.
17	EXP-OUT	Expander SUM amplifier output terminal, where the signal from gain cell is amplified as inverting amplifier.
18	RECE-IN	Receiver amplifier inverting input terminal
19	RO1	Receiving output terminal for dynamic receiver
20	RO2	Outputs from RO1 and RO2 (BTL type) when ceramic receiver is using.
21	BAT-ALM	Battery alarm terminal goes high when power supply voltage VCC becomes VBAT-L or less. Data bit controls the detection voltage. This terminal is an open collector output.
22	RSSI	DC voltage is output according to the input signal level of IF amplifier. The dynamic range is approximately 70dB.
23	DATA-OUT	Wave arrangement output terminal. This terminal is an open collector output.
24	D-COMP-IN	Data comparator input terminal to which demodulated signal of data is input.

**KX-TCM416SAB**

Pin No.	Name	Description
25	N FIL-IN	Noise filter input output terminal. BPF consists of external condenser and resistor. This terminal is connected to the rectifier circuit through inside coupling condenser.
26	N FIL-OUT	
27	AF-OUT	Demodulation output signal terminal. Carrier leak is decreased by built-in LPF. Output impedance is approximately 360Ω.
28	QUAD	Phase input terminal of FM demodulator
29	IF-OUT	IF output terminal
30	GND1	GND terminal
31	DEC	2nd IF input terminal and decoupling terminal for bias. Input impedance of Pin 32 is approximately 1.5kΩ.
32	IF-IN	
33	Vcc1	Power supply terminal
34	2nd MIX-OUT	Mixer output terminal. Output impedance is approximately 1.5kΩ.
35	N-REC	The noise filter output is filtered through external capacitor after amplified about 20dB
36	2nd MIX-IN	1st IF input terminal. Input impedance is approximately 4.7kΩ (at 10.695MHz).
37	E-RECT	Connects to the capacitor for rectification in full-wave rectifier circuit of expander.
38	1st MIX-OUT	Mixer output terminal which is connected to the external filter. Output impedance is approximately 330Ω (standard).
39	V REF	Reference voltage of compander which is passed through inside buffer.
40	1st MIX-IN	Mixer input terminal. The mixer is applied the double balanced mixer method.
41	VCC2	Regulator terminal, which outputs 2.0V.
42	VCO-CONT	RX-VCO voltage control terminal
43	VCO-1	RX-VCO resonant terminal
44	VCO-2	
45	C-RECT	Rectifier terminal of compressor. The circuit configuration is the same with E-RECT terminal.
46	RX-OUT	Charge pump output terminal. Constant current output type is adopted and output current can be changed according to the input data.
47	TX-OUT	
48	GND2	GND terminal

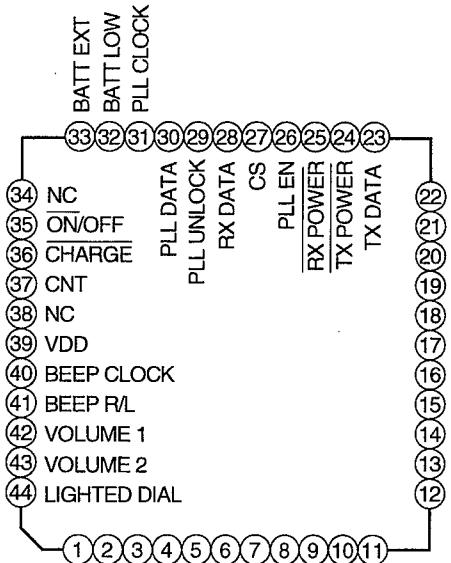


#### ● Pin Description

Pin No.	Pin Name	Function
1	RO+	Recept the outputted analog.
2	RO -	Recept the outputted analog.
3	PI	Input the power amp.
4	PO -	Output the power amp.
5	PO+	Output the power amp.
6	Vdd	Positive power supply pin.
7	FSR	Frame synchronization, reception
8	CR	Recept the data.
9	BCLKR	Recept the bit clock.
10	PDI	Input the power down.
11	MCLK	Master Clock pin.
12	BCLKT	Transmit the bit clock.
13	DT	Transmit the data.
14	FST	Frame synchronization, transmission
15	Vss	Negative power supply pin.
16	Mu/A	Select the Mu/A.
17	TG	Transmit gain
18	TI -	Transmit the inputted analog.
19	TI +	Transmit the inputted analog.
20	VAG	Output the analog ground.

## CPU DATA (HANDSET)

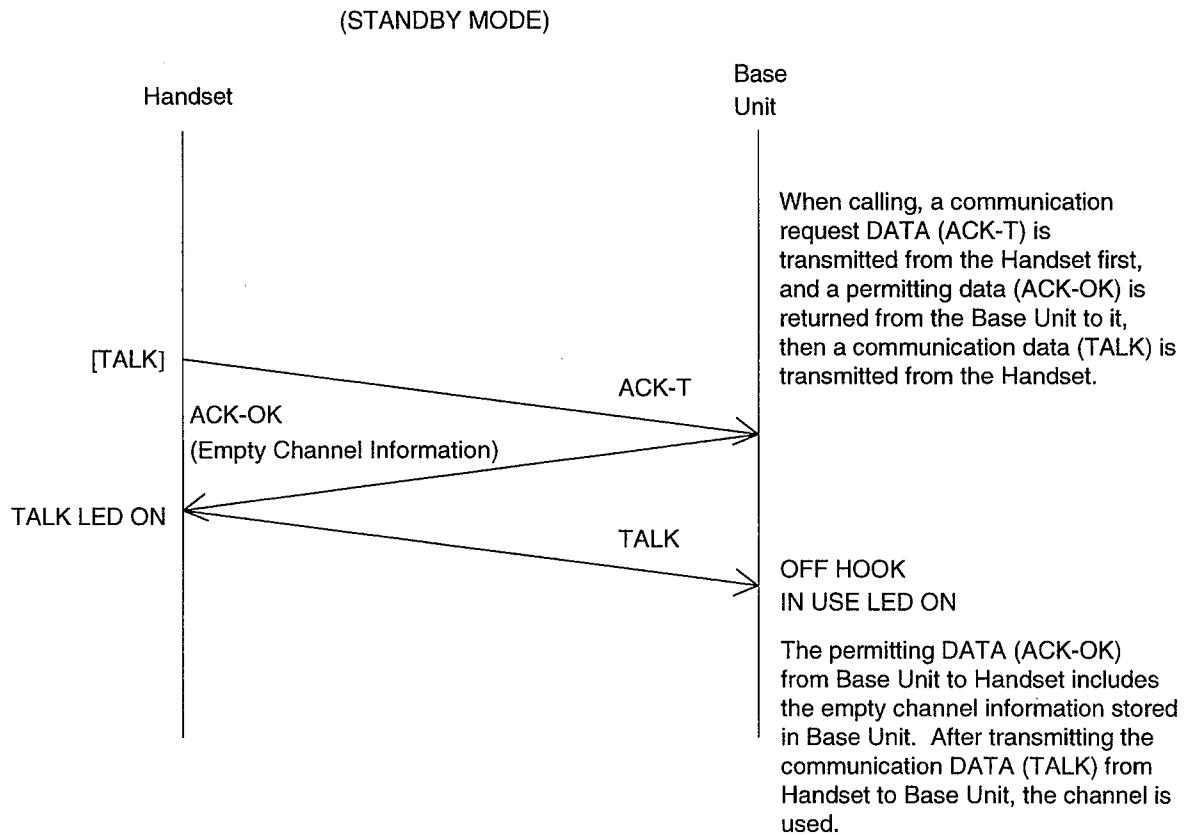
IC202



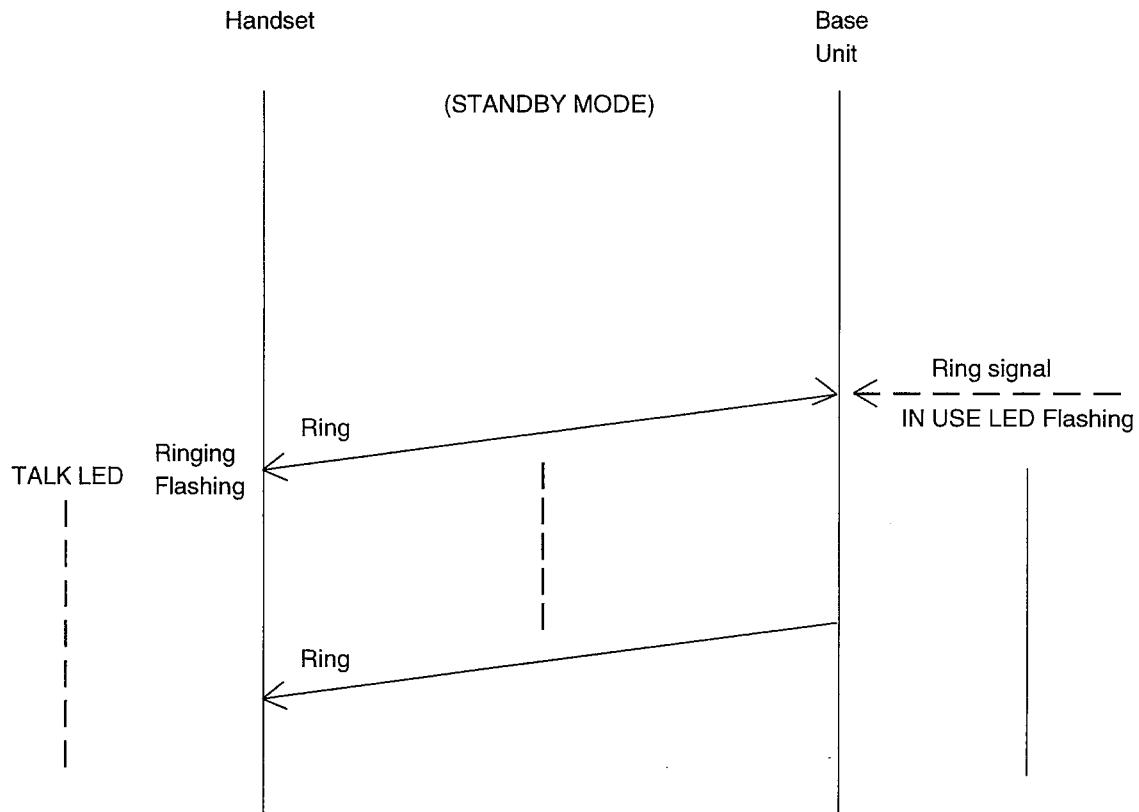
Pin No.	Description	I/O	High	High-Z	Low	Pin No.	Description	I/O	High	High-Z	Low
1	Option Strobe 1	O	Normal		Active	25	RX Power	O	Off		On
2	Option Strobe 0	O	Normal		Active	26	PLL En	O	Latch		Normal
3	Key Strobe 4	O	Normal		Active	27	Squelch	I	Electric Field Low		Electric Field High
4	Key Strobe 3	O		Normal	Active	28	RX Data	I	(Data)		Normal
5	Key Strobe 2	O		Normal	Active	29	PLL Unlock	I	Unlock		Lock
6	Key Strobe 1	O		Normal	Active	30	PLL Data	O	(Data)		Normal
7	Key Strobe 0	O		Normal	Active	31	PLL Clock	O	(Clock)		Normal
8	Key In 3	I	Off		On	32	Batt Low	I	High		Low
9	Key In 2	I	Off		On	33	Battery	I	High		Low
10	Key In 1	I	Off		On	34	Not Used				
11	Key In 0	I	Off		On	35	On/Off	I	Off		On
12	Not Used					36	Charge (Battery Terminal)	I	Normal		Charge
13	LED (SCREEN)	O		Off	On	37	Charge (Control)	I	Base Unit		Charger
14	LED (BATT LOW)	O		Off	On	38	Internally Conn.				
15	LED (TALK)	O		Off	On	39	VDD				
16	LED (INTERCOM)	O		Off	On	40	Beep Clock	O	Normal		(Clock)
17	GND					41	Beep Control	O	Low		High
18	Sub Clock	I				42	VOLUME 1	O			
19	(32.768kHz)	I				43	VOLUME 2	O	Low		High
20	Reset	I	Normal		Reset	44	LIGHTED DIAL	O	On		Off
21	Main Clock	I									
22	(3.99MHz)	I									
23	TX Data	O	(Data)								
24	TX Power	O	Off								

# **EXPLANATION OF CPU DATA COMMUNICATION**

## 1. Calling



## 2. Ringing

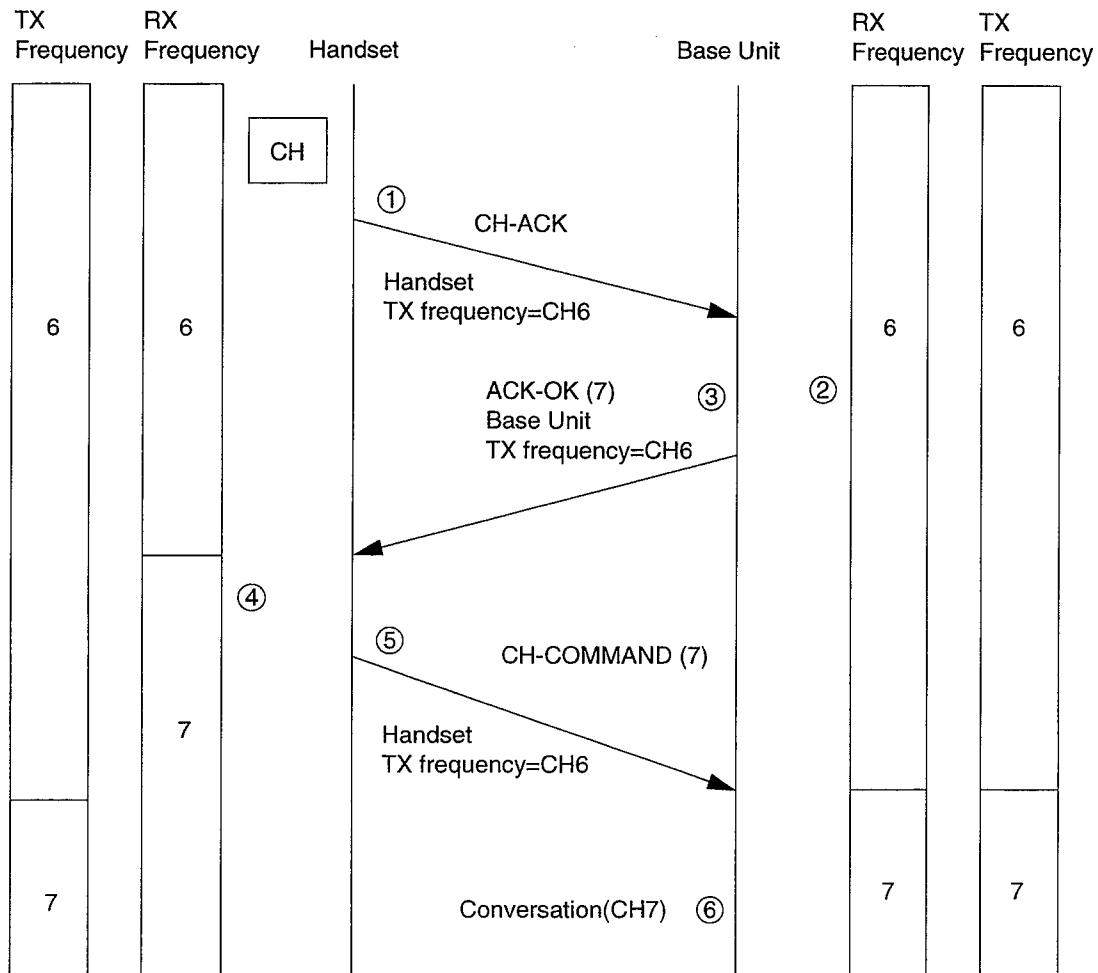


After detecting the Ring signal from circuit, Base Unit sends a ring signal DATA (Ring) on the base's (a) TX frequency, then the Handset starts ringing.

## KX-TCM416SAB

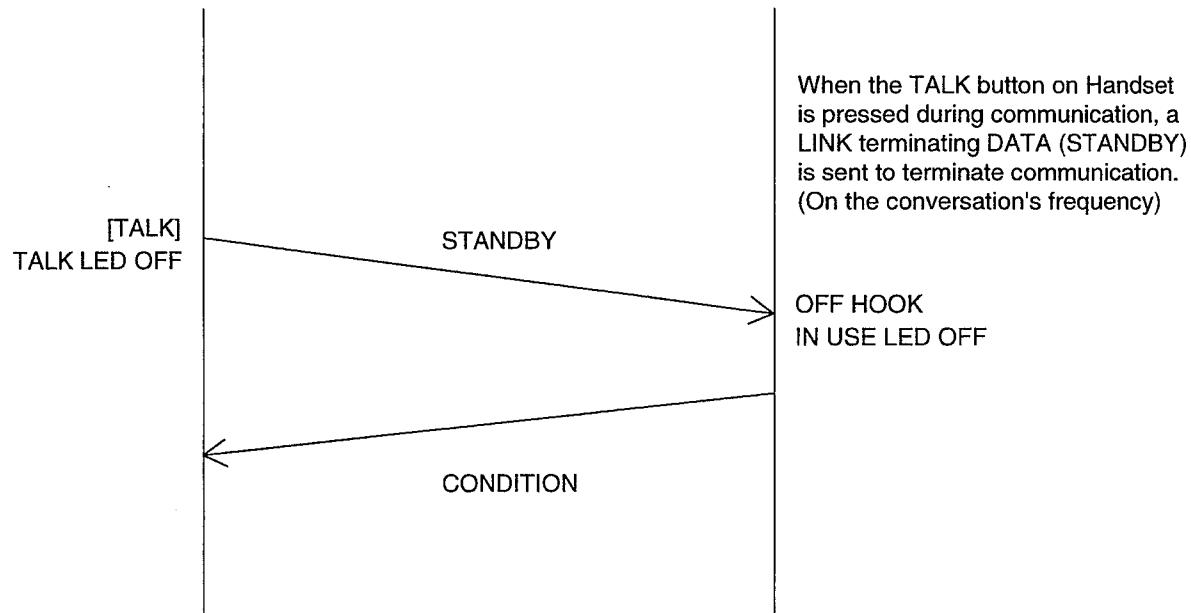
### CH CHANGE MODE:

ex): (CH6 → CH7)



- ① When the user pushes the CH button, the handset sends a CH-ACK request to the base unit. (on the handset's conversation frequency)
- ② The base unit select the base unit's RX frequency of the vacant (b) channel selected at random.
- ③ The base unit sends a ACK-OK.  
This ACK-OK includes the number of the vacant channel which selected in step 2.
- ④ The handset sets the handset's RX frequency to the vacant (b) channel in step 2.
- ⑤ The handset sends a CH-COMMAND.  
This CH-COMMAND includes the number of the vacant (b) channel.  
After sending the CH-ACK, handset changes to a vacant (b) channel.
- ⑥ The base unit changes to the vacant (b) channel.  
The conversation can be accessed.

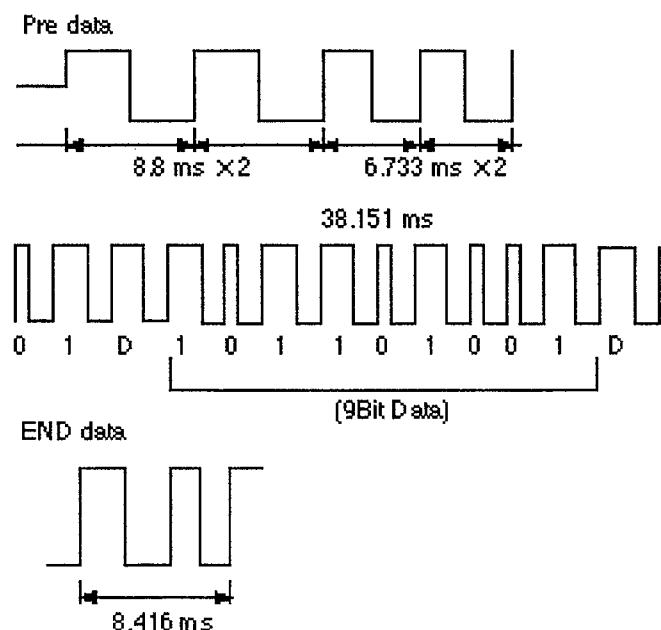
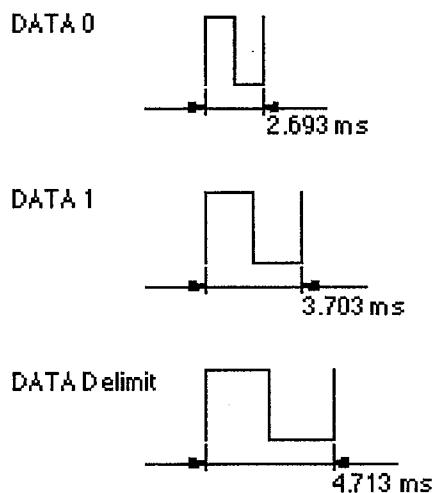
### 3. To terminate Communication



## KX-TCM416SAB

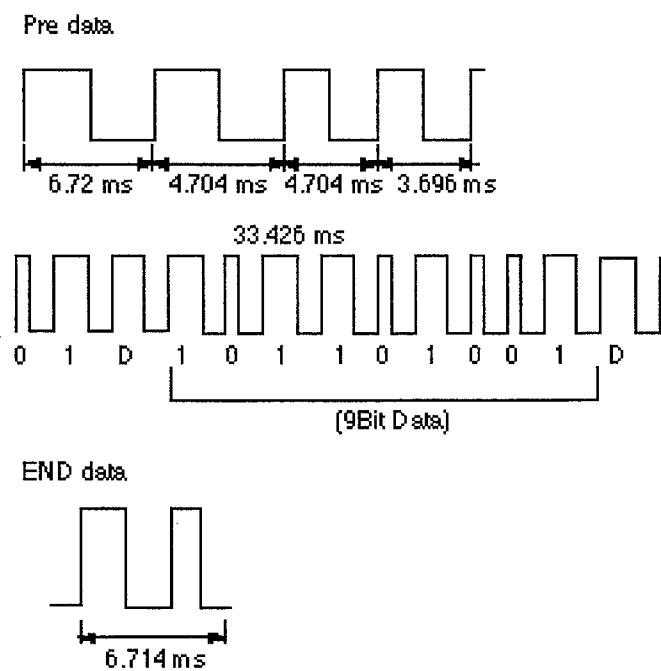
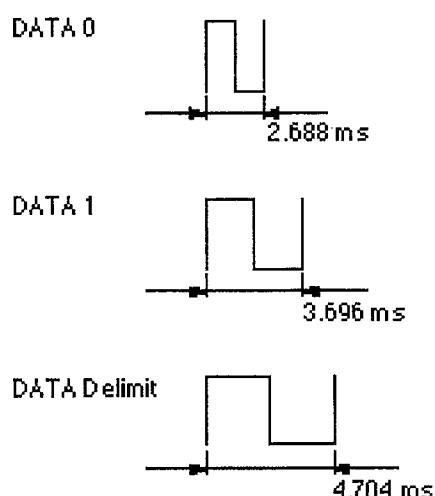
### HANDSET

#### Transmitting DATA Format

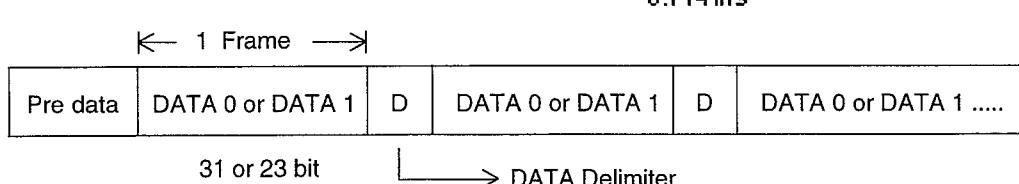


### BASE UNIT

#### Transmitting DATA Format

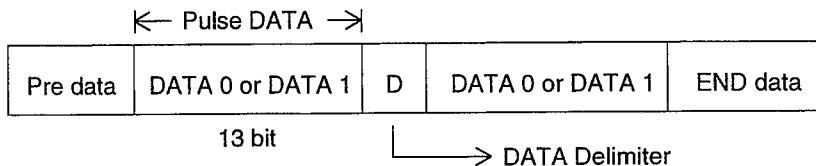


#### 6. When LINKing



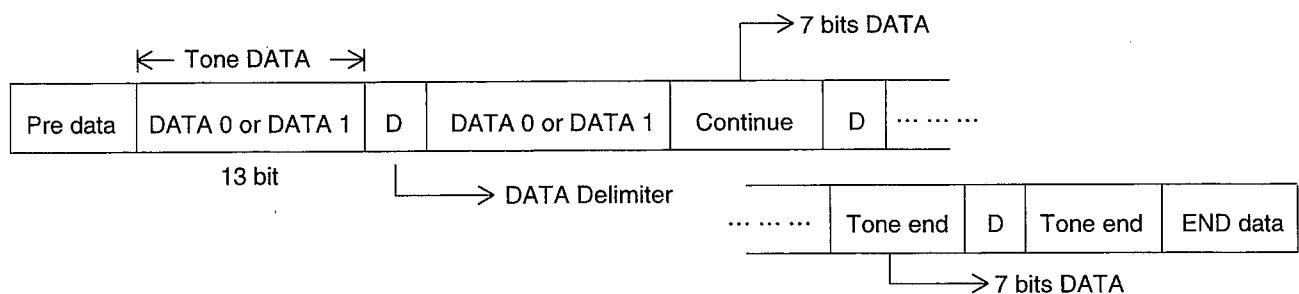
When LINKing from the Handset (changing from STBY to TALK), DATA is transmitted in above format. The combined portion of DATA 0 and DATA 1 is transmitted in LINK requesting DATA format first. Then, when LINK OK(ACK-OK) DATA is returned from the Base Unit, it is sent as LINK from DATA after changing the combination of DATA 0 and DATA 1. And the DATA Delimiter is between each Frame as a stop. The contents of LINK requesting DATA and LINK from DATA are different depending on each operation.

## 7. Pulse Dial



When executing Pulse Dial, the Pulse Dial DATA is transmitted from the Handset to the Base Unit in above format. The combination of DATA 0 and DATA 1 are changed by each Dial No. And the DATA Delimiter is between each Frame as a stop. The number of Frame is 2.

## 8. Tone Dial



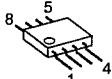
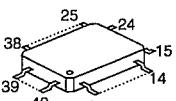
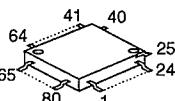
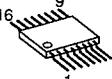
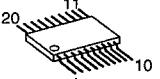
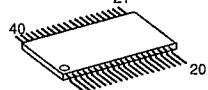
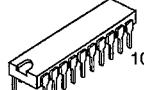
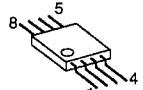
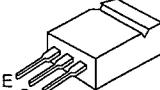
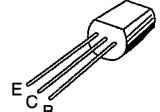
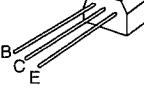
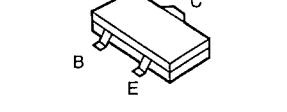
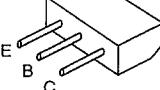
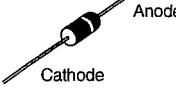
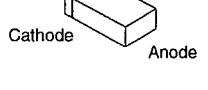
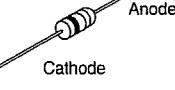
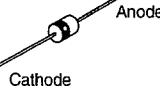
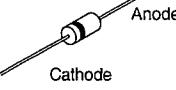
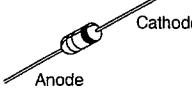
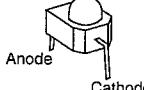
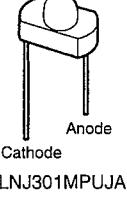
When executing Tone Dial, Tone Dial DATA is transmitted from the Handset to the Base Unit in above format. The DATA is changed by Dial No. as same as Pulse Dial. When Tone Dialing, DATA (Continue DATA) that the key is pressed continuously is sent to the Base Unit during the key is pressed. When depressing the key, the TONE Dial exterminating DATA (Tone end DATA) is send, and the END data is sent finally.

## NOTE

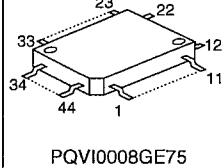
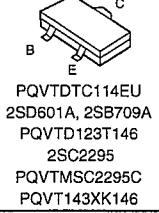
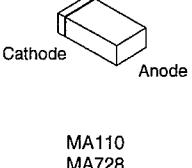
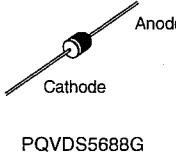
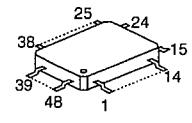
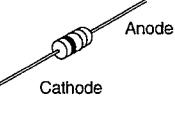
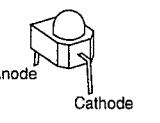
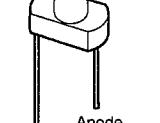
65,000 kinds of the security code are available for the model KX-TCM416SAB. Each time the handset is set on the cradle of the base unit (for charging), the CPU automatically changes the security code.

## **TERMINAL GUIDE OF IC'S, TRANSISTORS AND DIODES**

**(BASE UNIT)**

 AN6183SAE1 PQVI93LC46XI	 PQVIT31224AH	 PQVI53MF5017 PQVID6471A2	 PQVIBU4053BF	 PQVIMCL548DW
 PQWITCM422HM	 PQVISC111815	 PQVINJM4558M	 2SD2137	 2SA1625 PQVTKSD261CY
 2SC1740S	 2SK543	 PQVTMSC2295C, 2SC2412K, 2SD1819A 2SB709A, 2SD601A, PQVTFB1A4M 2SB1218A, PQVTDTA114YU, UN5213		 2SD1994A 2SD1991A
 PQVDS1ZB40F1	 MA110 PQVDKV1832C3	 MA4100, MA4062 MA4047, MA4020	 1SS119	 MA700A
 MA4220	 PQVDSLNLN210VC	 LNJ301MPUJA		

**(HANDSET)**

 PQVI0008GE75	 PQVIXCC3501P PQVIS80730AL	 PQVTDTCT114EU 2SD601A, 2SB709A 2SC2295 PQVTMSC2295C PQVT143XK146	 MA110 MA728	 PQVDS5688G
 PQVIT31224AR	 XN1116	 MA840BTAKU MA840ATAKU	 PQVDSLNLN210VC	 LNJ301MPUJA

## CPU OPTIONS

**Base Unit**

Diode No.	Description	Diode Open	Diode Connect
D514	Tone/Pulse Selector	Tone	Pulse
D515	Voice Synthesis Test	Normal	Voice Synthesis Test
D512	Quick Charge	Enable	Disable
D507	Ring Detect	1Ring/600 msec	1 Ring/250 msec
D508	Speakerphone	Disable	Enable
D505	VOX detect	Not detect	Detect
D506	% Break	67%	61%
D503	On-hook detection time	6 sec	4 sec
D504	Auto disconnect	Enable	Disable
D501	TAM Test Mode	Normal	Test

**Handset**

Diode No.	Description	Diode Open	Diode Close
D209	Test Mode	Normal	Test Mode
D208	Model with TAM	—	Used
D207	China (46/49MHz)	46/49	China (45/48MHz)
D206	Test Mode CH	CH10	Imagination CH
D213	Receivers volume	2 steps	1 step
D212	30 MHz / 40 MHz	Not Measured	Measured
D211	Battery Low LED	30 min. Light	10 min. Light
D210	Test mode CH	—	Imagination CH

## ADJUSTMENTS (BASE UNIT)

If your unit have below symptoms, adjust each item using remedy column from the table.

Symptom	Remedy
The base unit does not respond to a call from handset.	Make adjustments in item (A)
The base unit does not transmit or the transmit frequency is off.	Make adjustments in item (B)
The transmit frequency is off.	Make confirmations in item (C)
The transmit power output is low, and the operating distance between base unit and handset is less than normal.	Make adjustments in item (D)
The reception sensitivity of base unit is low with noise.	Make adjustments in item (E)
The transmit level is high or low.	Make adjustments in item (F), (G)
The reception level is high or low.	Make adjustments in item (H)
The unit does not link.	Perform tests in item (I)

**Unit condition:**

Remove the antenna from P.C Board of the base unit.

**How to set the test mode:**

1. In pressing S1 and "UP" switch, set S10 to ON (Power supply is turned ON).
2. Release S1 and "UP" switch. The unit becomes test mode (1).
3. The state of the unit changes as following when "NEW MESSAGE" switch is pressed.



	Test Mode	RX Freq.	TX Freq.	Mode
Power supply is turned ON	Test Mode (1)	CH7	CH7	Talk
Press "NEW MESSAGE" switch 1 time	Test Mode (2)	CHA	CHA	Talk
Press "NEW MESSAGE" switch 1 time	Test Mode (3)	CHB	CHB	Talk
Press "NEW MESSAGE" switch 1 time	Test Mode (4)	CHC	CH1	Talk
Press "NEW MESSAGE" switch 1 time	Test Mode (5)	CH1	CHB	Int'com
Press "NEW MESSAGE" switch 1 time	Test Mode (6)	CH1	CHB	Locator

When replacing these parts, adjust as shown below table.

Replace Parts	Adjustment items	Test Mode	Adjustment point	Procedure
IC201, T203	(A) RX VCO Adjustment	Test Mode (1)	T203	1. Set S3 to ON. 2. Adjust T203 so that the reading of the Digital Voltmeter is $3.5V \pm 0.1$ V.
D301, T301	(B) TX VCO Adjustment	Test Mode (1)	T301	1. Set S2 to ON. 2. Adjust T301 so that the reading of the Digital Voltmeter is $2.0 V \pm 0.1$ V.
DUP301, T202, X201	(C) TX Frequency Confirmation	Test Mode (3)	—	1. Set S8 to ON. 2. Confirm so that the reading of the frequency counter is $46.800\text{ MHz} \pm 700\text{ Hz}$ .

When replacing these parts, adjust as shown in table below.

Replace Parts	Adjustment items	Test Mode	Adjustment Point	Procedure
VR302, Q302	(D) TX Power Adjustment	Test Mode (2)	VR302	1. Set S4 to ON. 2. Adjust VR302 so that the reading of the RF VTVM is 270 mV±10 mV.
T201	(E) RX Sensitivity Adjustment	Test Mode (2)	T201	1. Set S5 to ON. 2. Apply a 60dB $\mu$ Vemf output from S.S.G. (modulation frequency 1kHz, dev. 0kHz). 3. Adjust T201 so that the reading of the RF VTVM is maximum output (7~25 mV).
T202	(F) Line Output Maximum Adjustment	Test Mode (3)	T202	1. Set S5 and S6 to ON. 2. Apply a 40dB $\mu$ Vemf output from S.S.G. (modulation frequency 1kHz, dev. 0 kHz), and adjust T202 so that reading of the Digital Voltmeter is 0.9 V±0.05 V.
VR201	(G) Line Output Level Adjustment	Test Mode (3)	VR201	1. Set S5 and S6 to ON. 2. Apply a 40dB $\mu$ Vemf output from S.S.G (modulation frequency 1kHz, dev. 3kHz). 3. Adjust VR201 so that the reading of the AF VTVM is -1.0dBm±0.5dBm (600Ω load).
VR301	(H) Line Input Modulation Test	Test Mode (3)	VR301	1. Set S5, S7 and S9 to ON. 2. Input via loop simulator 1.0kHz, -20.0 dBm/600Ω. 3. Apply a 40 dB $\mu$ Vemf output from S.S.G. (modulation frequency 1kHz, dev. 0kHz). 4. Adjust VR301 so that the reading of the FM Deviation Meter is 2.5 kHz±0.1kHz.
IC201	(I) Carrier Sensitivity Test	Test Mode (4)	—	1. Set S5 to ON. 2. Apply a 35dB $\mu$ Vemf output from S.S.G. (modulation frequency 1kHz, dev. 3kHz). Confirm so that the oscilloscope becomes Low. 3. Apply a 15dB $\mu$ Vemf output from S.S.G. (modulation frequency 1kHz, dev. 3kHz). Confirm so that the oscilloscope becomes High.

The connection of adjustment equipment is as shown on page 28.

## ■ FOR SCHEMATIC DIAGRAM [BASE UNIT (page 29)]

- DC voltage measurements are taken with electronic voltmeter from negative voltage line.

This schematic diagram may be modified at any time with development of new technology.

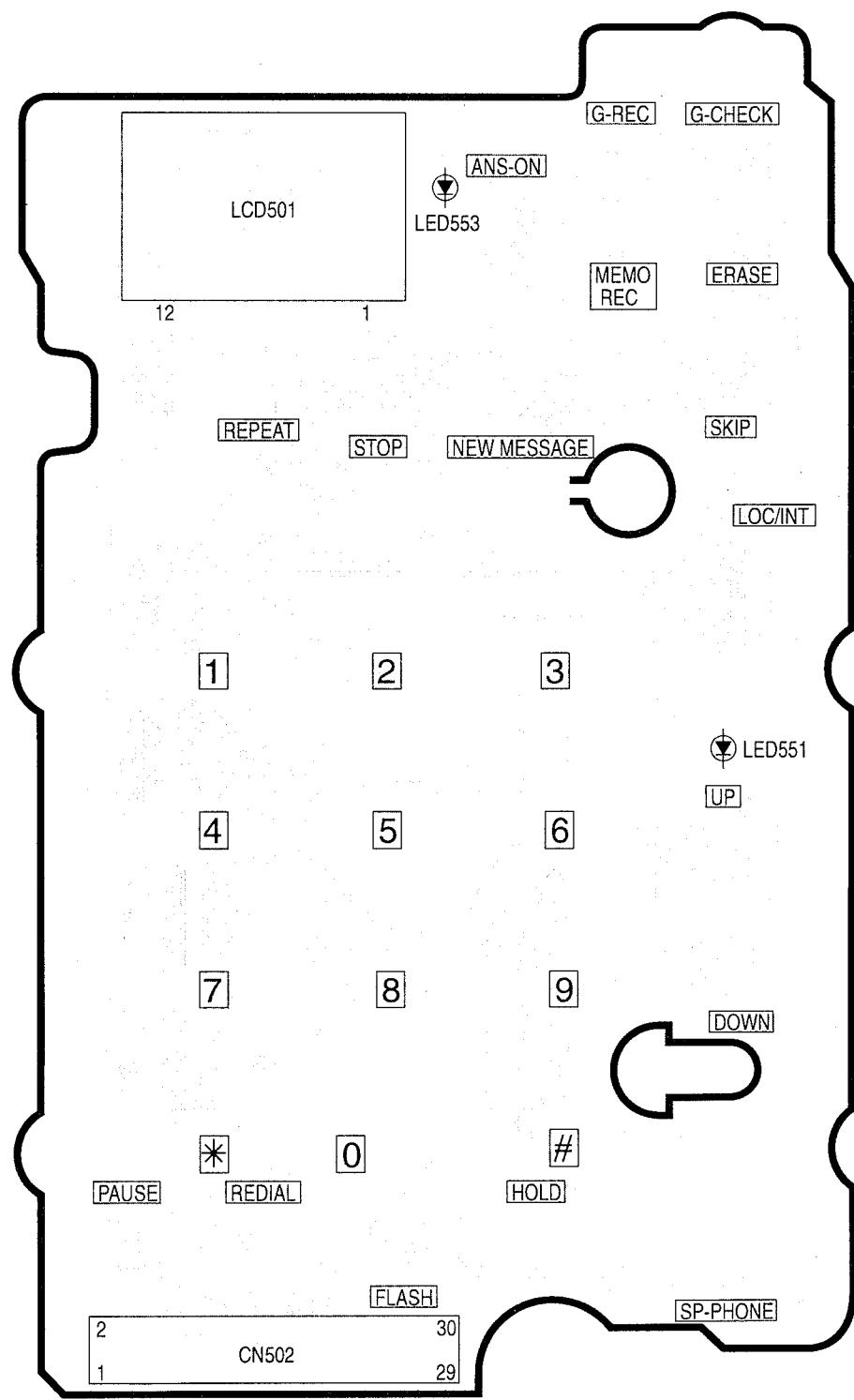
### Important Safety Notice

The shaded area on this schematic diagram incorporates special features important for protection from fire and electrical shock hazards.

When servicing it is essential that only manufacturer's specified parts be used for the critical components in the shaded areas of the schematic.

## CIRCUIT BOARD (OPERATION)

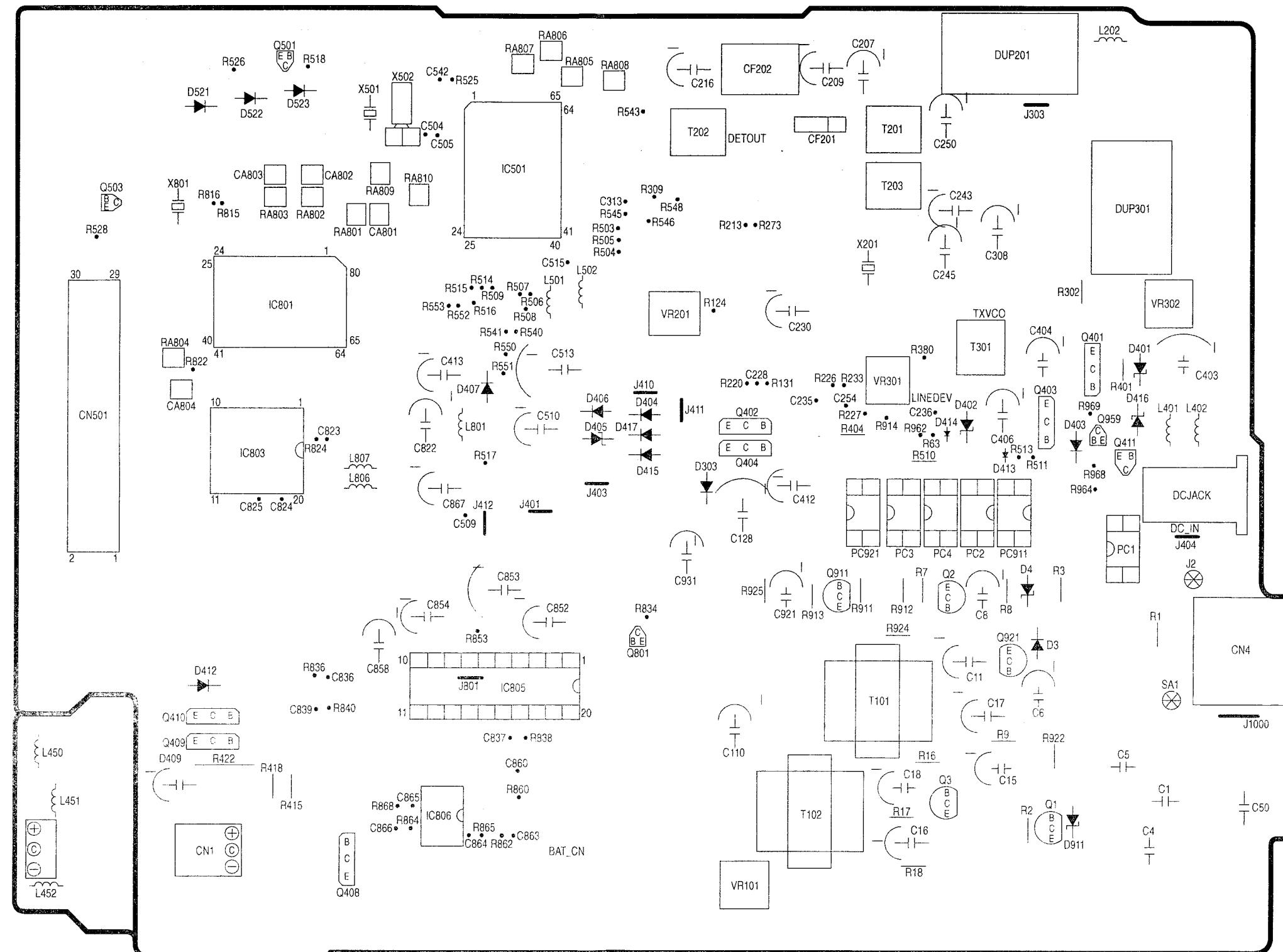
1 2 3 4 5 6

A  
B  
C  
D  
E  
F  
G  
H

## CIRCUIT BOARD AND WIRING CONNECTION DIAGRAM (BASE UNIT)

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |

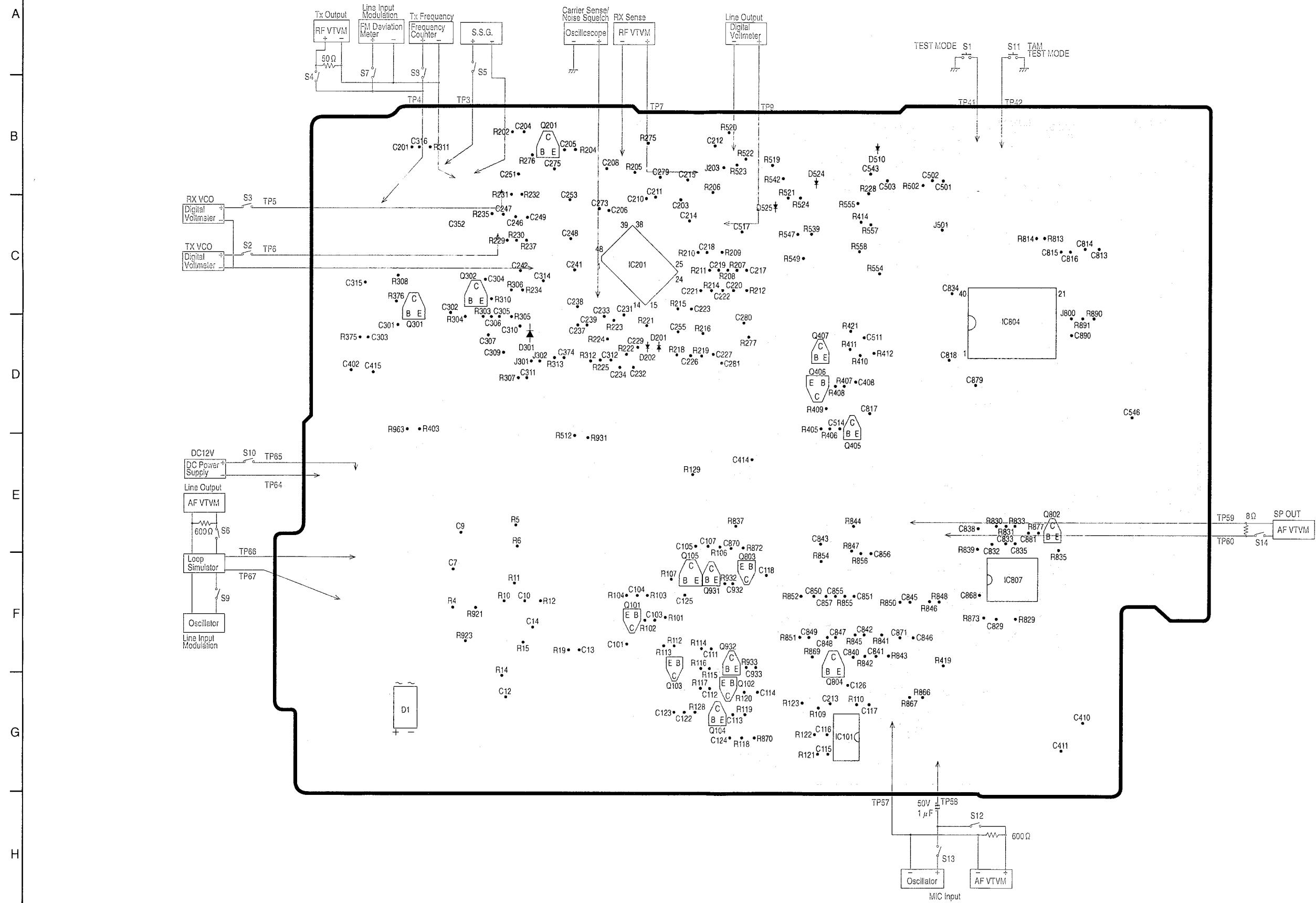
(Component View)



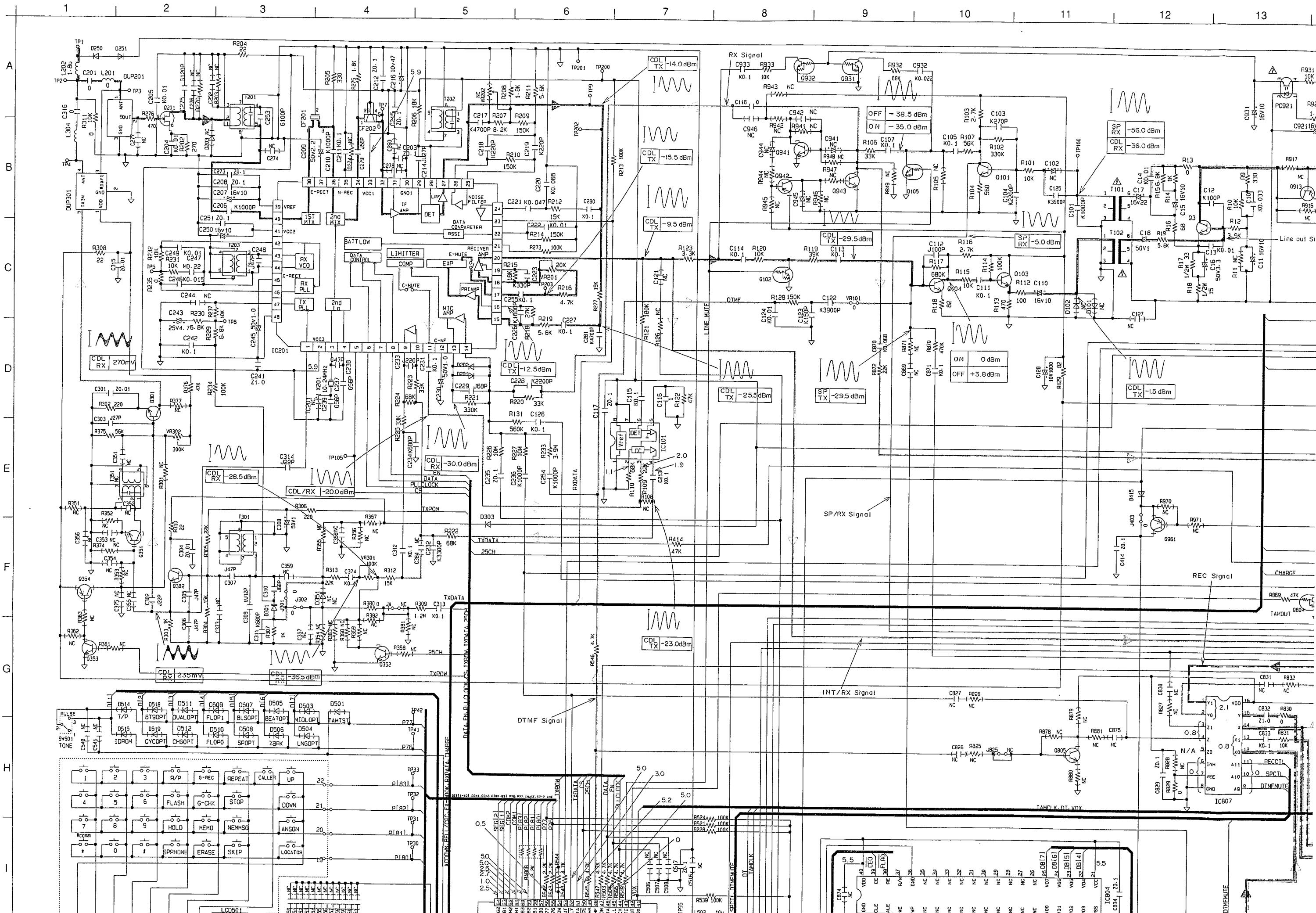
## CIRCUIT BOARD AND WIRING CONNECTION DIAGRAM (BASE UNIT)

1           |       2           |       3           |       4           |       5           |       6           |       7           |       8           |       9           |       10          |       11          |       12

(Flow Solder Side View)

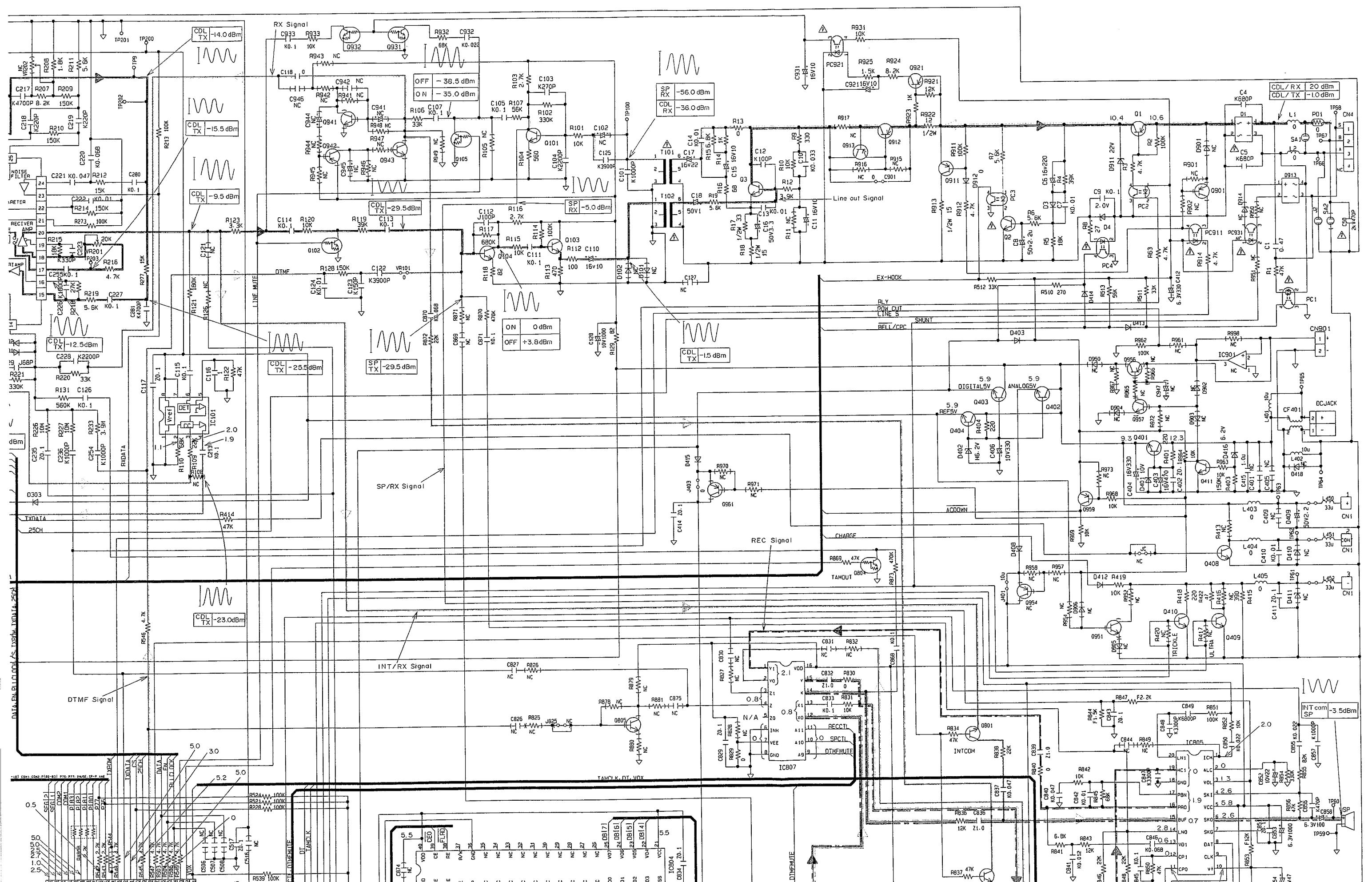


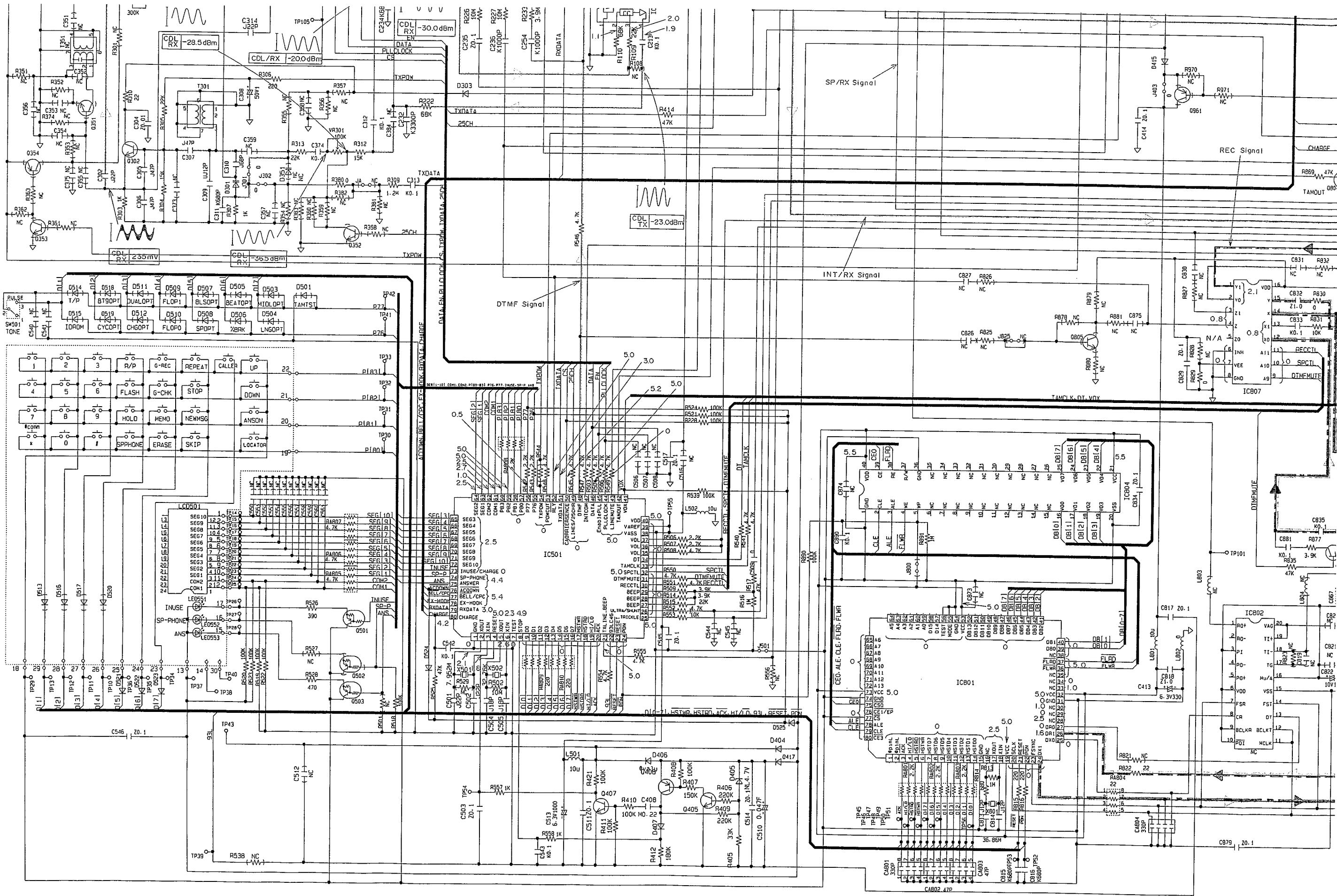
# SCHEMATIC DIAGRAM (BASE UNIT)

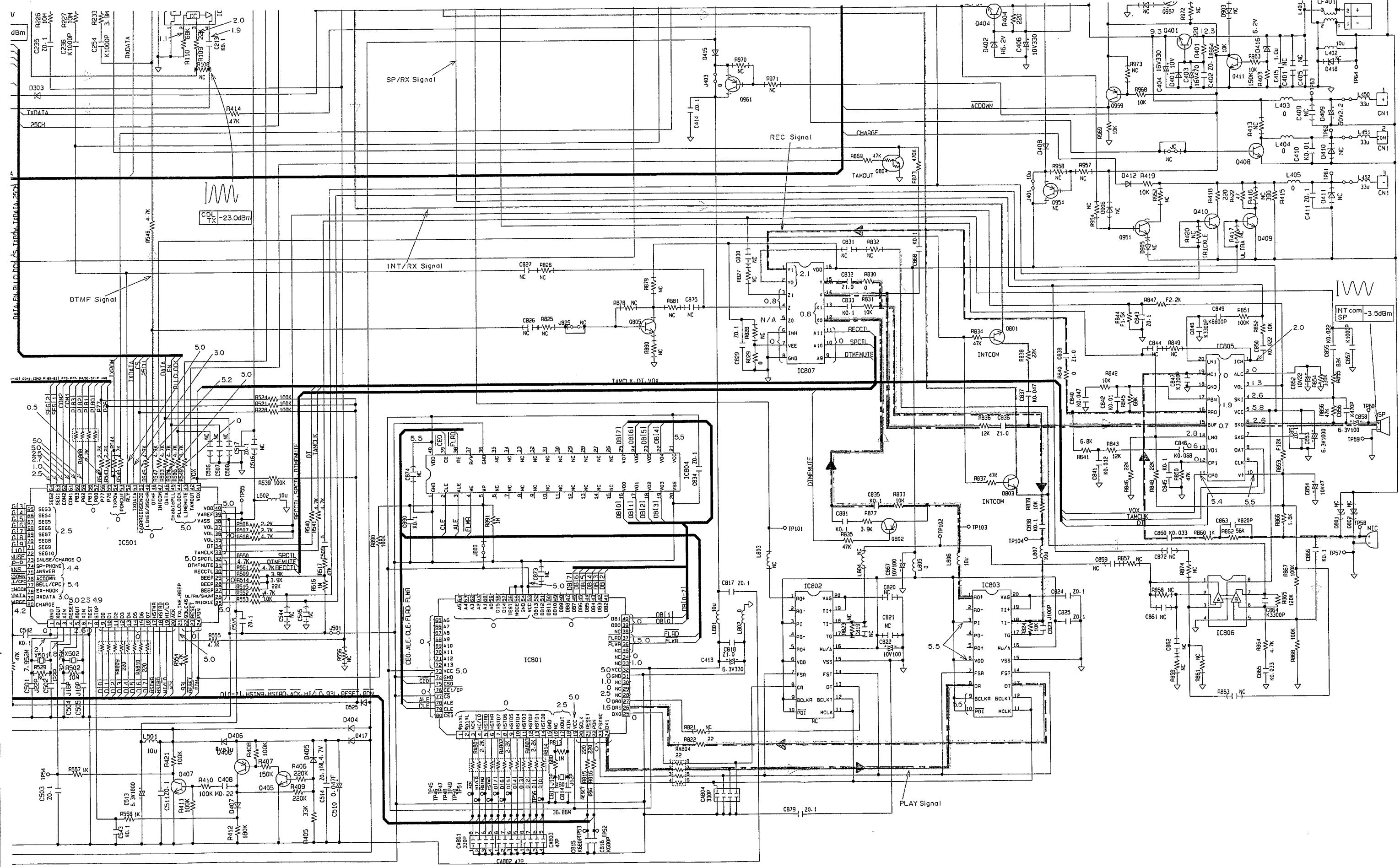


## **SCHEMATIC DIAGRAM (BASE UNIT)**

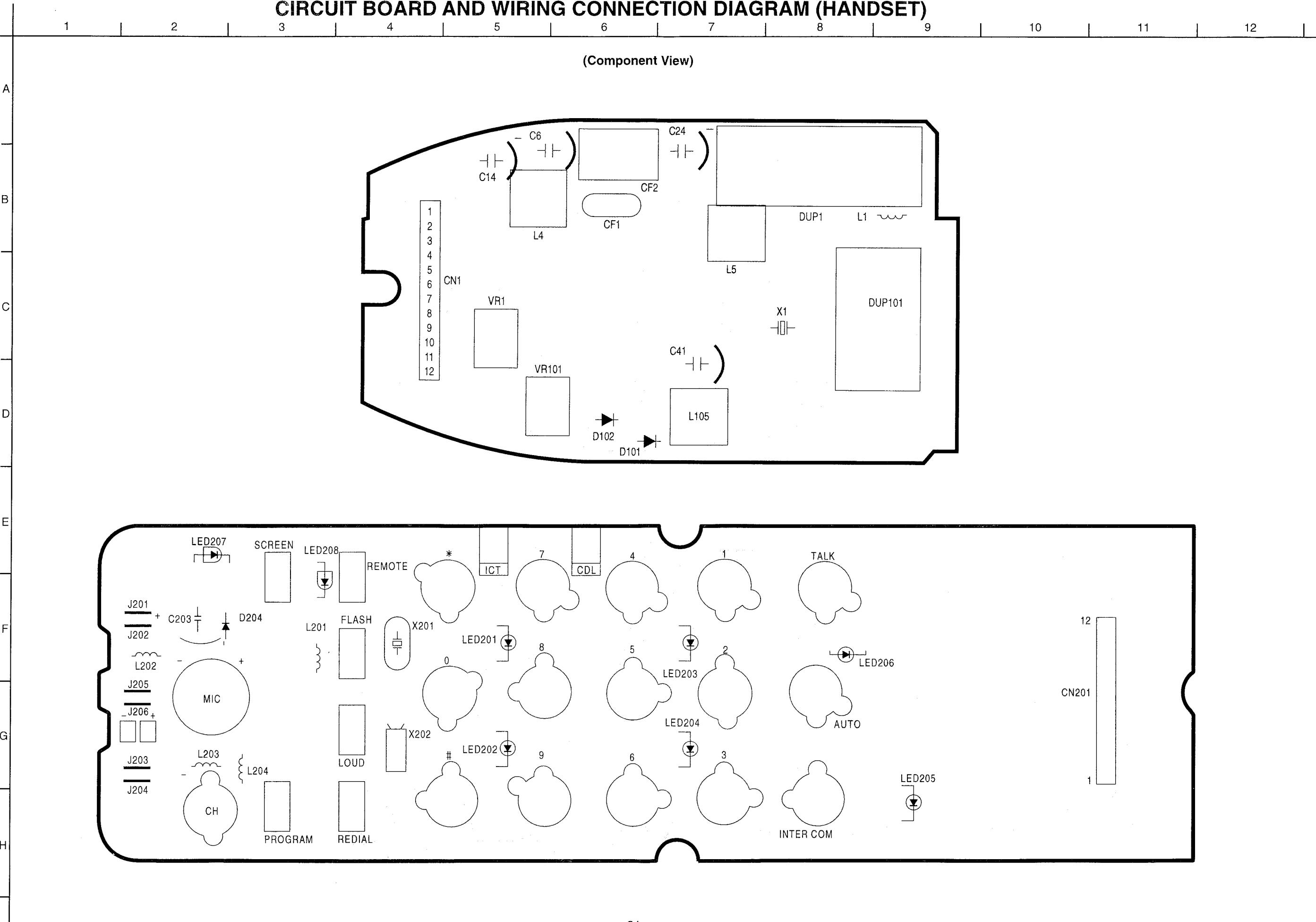
**KX-TCM416SAB**







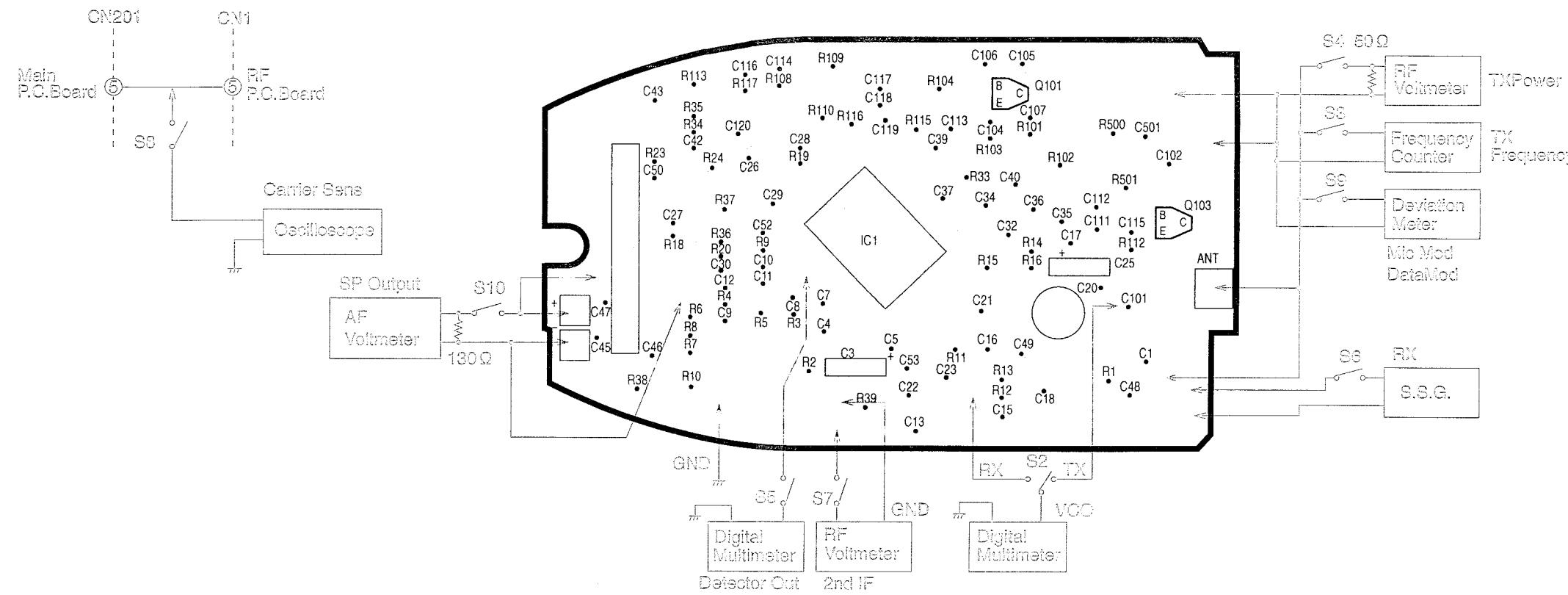
## CIRCUIT BOARD AND WIRING CONNECTION DIAGRAM (HANDSET)



## CIRCUIT BOARD AND WIRING CONNECTION DIAGRAM (HANDSET)

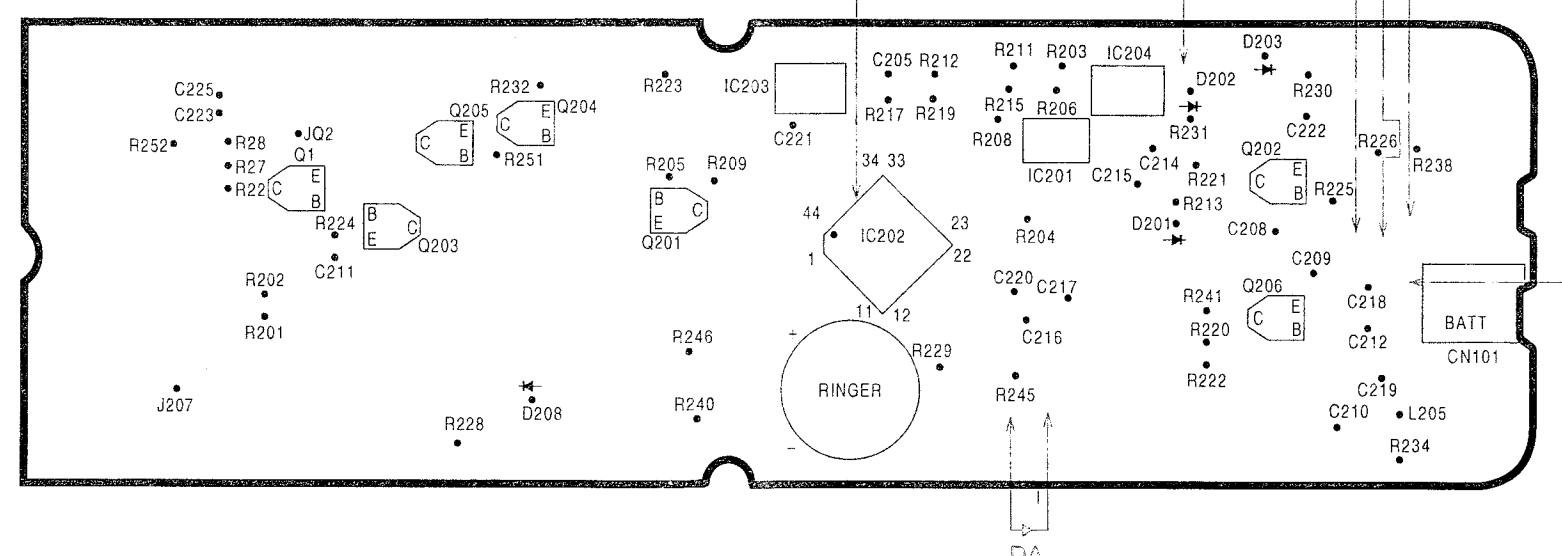
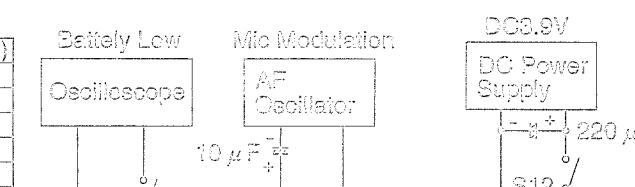
1 2 3 4 5 6 7 8 9 10 11 12

(Flow Solder Side View)

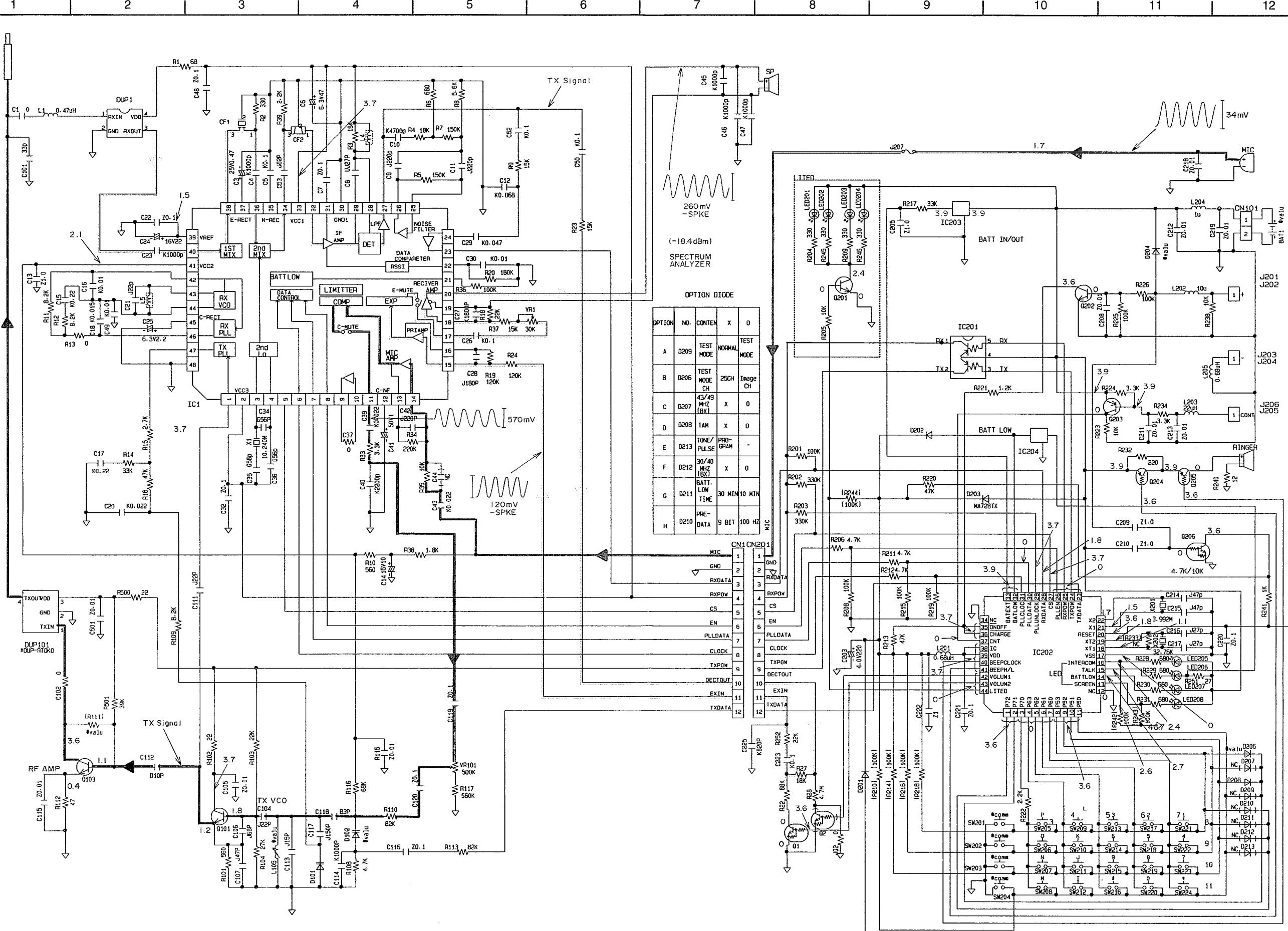


IC202Voltage No Mark: Standby, ( ):Talk

Pin No.	Value (V)	Pin No.	Value (V)	Pin No.	Value (V)
1,2	3.6	19	1.0	31	-
3 ~ 7	0	20	0.6	32	3.9
8 ~ 11	3.6	21	1.5	33	3.9
12	0	22	1.2	34-35	-
13,14	2.7	23 ~ 26	0	36	3.7
15	4.7	27	3.7	37	0
16	2.4	28	1.8	38	3.3
17	0	29	3.7	39 ~ 41	3.7
18	1.1	30	0	42 ~ 44	0



## **SCHEMATIC DIAGRAM (HANDSET)**



## ADJUSTMENTS (HANDSET)

If your unit have below symptoms, adjust each item using remedy column from the table.

Symptom	Remedy
The setting of Battery Low Indicator is wrong.	Perform checks in item (A)
The base unit does not respond to a call from handset.	Make adjustment in item (B)
The base unit does not transmit or the transmit frequency is off.	Make adjustment in item (C)
The transmit frequency is off.	Perform checks in item (D)
The transmit power output is low, and the operating distance between base unit and handset is less than normal.	Perform checks in item (E)
The reception sensitivity of base unit is low with noise.	Make adjustment in item (F)
Does not link between base unit and handset.	Perform checks in item (G), (H)
The reception level is high or low.	Make adjustment in item (I)
The transmit level is high or low.	Make adjustment in item (J)

### Unit condition:

1. Remove the antenna lead wire from P.C Board of handset.
2. Connect the Main P.C.Board (CN201) and RF P.C.Board (CN1) by extension cord (PQZZ12K11Z).
3. Power Supply: DC 3.9V
4. Speaker Load:  $130\Omega$

### How to set the test Mode

1. After connecting diode DA, set S12 to ON (Power supply is turned ON).
2. The unit enters test mode (1).
3. The state of the unit changes as following when "AUTO" switch is pressed.

	Test Mode	RX Freq.	TX Freq.	Mode
Power supply is turned ON	Test Mode (1)	CH7	CH7	Talk
Press "AUTO" switch 1 time	Test Mode (2)	CHA	CHA	Talk
Press "AUTO" switch 1 time	Test Mode (3)	CHB	CH1	Talk
Press "AUTO" switch 1 time	Test Mode (4)	CH1	CH1	Talk
Press "TALK" switch 1 time	Test Mode (5)	CH1	CHB	Standby

When replacing these parts, adjust as shown in table below.

Replace Parts	Adjustment items	Test Mode	Adjustment Point	Procedure
IC202	(A) Battery Low Check	Test Mode (1)	—	1. Set S1 to ON. 2. Set the power supply voltage to DC 3.62 V, and confirm so that the reading of oscilloscope is High. 3. Set the power supply voltage to DC 3.52 V, and confirm so that the reading of oscilloscope is Low.
IC1, X1, L105	(B) TX VCO Voltage Adjustment	Test Mode (1)	L105	1. Set S2 to TX VCO side. 2. Adjust L105 so that the reading of digital voltmeter is $3.0\text{ V}\pm0.1\text{ V}$ (After adjusting, set S2 to OFF).

When replacing these parts, adjust as shown in table below.

Replace Parts	Adjustment items	Test Mode	Adjustment Point	Procedure
IC1, X1, L5	(C) RX VCO Voltage Adjustment	Test Mode (1)	L5	1. Set S2 to RX VCO side. 2. Adjust L5 so that the reading of digital voltmeter is $1.8\text{ V}\pm0.1\text{ V}$ (After adjusting, set S2 to OFF).
X1, IC1	(D) TX frequency Check	Test Mode (2)	—	1. Set S3 to ON. 2. Confirm that the reading of frequency counter is $49.650\text{ MHz}\pm700\text{ Hz}$ .
DUP101	(E) TX Output Check	Test Mode (1)	—	1. Set S4 to ON. 2. Output level should be over $270\text{~}450\text{ mV}$ on RF VTVM ( $50\Omega$ load).
L4,DUP1	(F)RX Adjustment (Detector Output) (2nd IF Output)	Test Mode (2)	L4	1. Set S5 and S6 to ON. 2. Apply a $45\text{ dB}\mu\text{Vemf}$ output from S.S.G. (modulation frequency 1 kHz, dev. 0 kHz) 3. Adjust L4 so that the reading of DC voltmeter $0.9\pm0.05\text{ V}$ 4. Set S7 and S6 to ON. 5. Apply a $60\text{ dB}\mu\text{Vemf}$ output from S.S.G. (modulation frequency 1kHz, dev. 0 kHz) 6. Confirm 2nd IF output so that its reading of RF VTVM is maximum output ( $7\text{--}25\text{ mV}$ ).
	(G) Carrier Sensitivity Check	Test Mode (2)	—	1. Set S6 and S8 to ON. 2. Apply $30\text{ dB}\mu\text{Vemf}$ output from S.S.G.(modulation frequency 1kHz, dev. 3 kHz) signal on oscilloscope becomes low. 3. Apply $15\text{ dB}\mu\text{Vemf}$ output from S.S.G.(modulation frequency 1kHz, dev. 3 kHz) signal on oscilloscope becomes high.
	(H) Data Modulation Check	Test Mode (2)	—	1. Set S9 to ON. 2. Keep pressing the flash button. 3. Confirm for a 4.0–7.0 kHz FM Deviation Meter reading.
VR1	(I) Speaker Output Level Adjustment	Test Mode (2)	VR1	1. Set S6 and S10 to ON. 2. Apply a $45\text{ dB}\mu\text{Vemf}$ output from S.S.G.(modulation frequency 1kHz, dev. 3kHz). 3. Adjust VR1 so that the reading of AF VTVM is $-30\text{dBm}\pm0.5\text{ dB}$ .
VR101	(J) MIC Modulation Factor Adjustment	Test Mode (2)	VR101	1. Set S9 and S11 to ON. 2. Apply a MIC signal (1kHz, $-40\text{ dBm}$ at $600\Omega$ load). 3. Adjust VR 101 so that the reading of FM Deviation Meter is $2.7\text{kHz}\pm0.1\text{kHz}$ .

The connections of adjustment equipments are as shown on page 32.

### For SCHEMATIC DIAGRAM (HANDSET) [Page 33]

1. SW201: Talk Switch
2. SW202: Auto Switch
3. SW203: Intercom Switch
4. SW204: Channel Switch
5. SW205: Program/2Way Rec Switch
6. SW208: Screen/Playback Switch
7. SW209: Loud/Ringer Switch
8. SW210: Flash Switch
9. SW211: Redial Switch
10. SW213–224: Dialing Switch
11. DC voltage measurements are taken with electronic voltmeter from negative voltage line.  
(Talk Position)

This schematic diagram may be modified at any time with the development of new technology.

## FREQUENCY TABLE (MHz)

	BASE UNIT		HANDSET	
	Transmit Frequency	Receive Frequency	Transmit Frequency	Receive Frequency
1	46.610	49.670	49.670	46.610
2	46.630	49.845	49.845	46.630
3	46.670	49.860	49.860	46.670
4	46.770	49.830	49.830	46.770
5	46.830	49.890	49.890	46.830
6	46.870	49.930	49.930	46.870
7	46.970	49.970	49.970	46.970
A	46.990	49.950	49.650	46.800
B	46.800	49.700	—	46.750
C	—	49.810	49.800	46.950

## RF SPECIFICATION

### BASE UNIT

Item	Value	Refer to —.	Remarks
TX Frequency	46.800 MHz±700 Hz	Page 24 (C)	
TX Power	260 mV~280 mV	Page 25 (D)	
Line Modulation factor	2.5 kHz±0.1 kHz	—	Input signal from Tel line: -20 dBm/600Ω, f=1.0 kHz at CHB Talk
Line Modulation Distortion	Less than 7%	—	Input signal from Tel line: -20 dBm/600Ω, f=1.0 kHz at CHB Talk
Line Modulation factor (Max.)	4.0 kHz~6.5 kHz	—	Input signal from Tel line: 0 dBm/600Ω, f=1.0 kHz at CHB Talk
Data Modulation factor	4.5 kHz~6.5 kHz	—	Press Locator switch at CHB Standby

### HANDSET

Item	Value	Refer to —.	Remarks
Practical Sensitivity	Less than 9 dBμV	—	at CHA Talk
Carrier Sensitivity	Less than 30 dBμV	—	High→Low at CHB Talk
TX Frequency	49.650 MHz±700 Hz	Page 34 (D)	
TX Output	270 mV~450 mV	Page 34 (E)	
Data Modulation factor	4.0 kHz/dev~7.0 kHz/dev	Page 34 (H)	
MIC Modulation factor	2.6 kHz/dev~2.8 kHz/dev	—	Input signal from MIC: -40 dBm/600Ω, f=1.0 kHz at CHA Talk

## HOW TO CHECK THE HANDSET SPEAKER

1. Prepare the digital voltmeter, and set the selector knob to ohm meter.
2. Put the probes at the speaker terminals as shown in Fig. 7.

3.

Is the value between  
(+)-terminal and (-)-terminal about 130Ω?

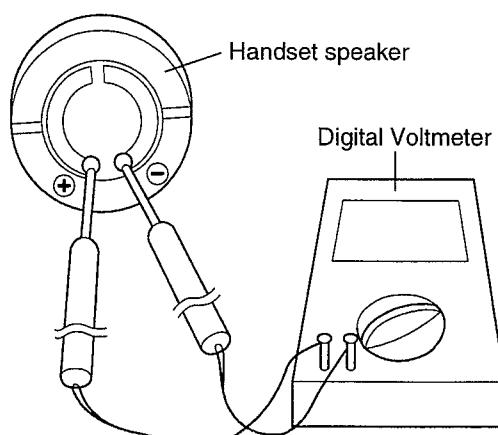
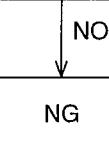
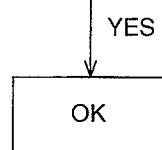
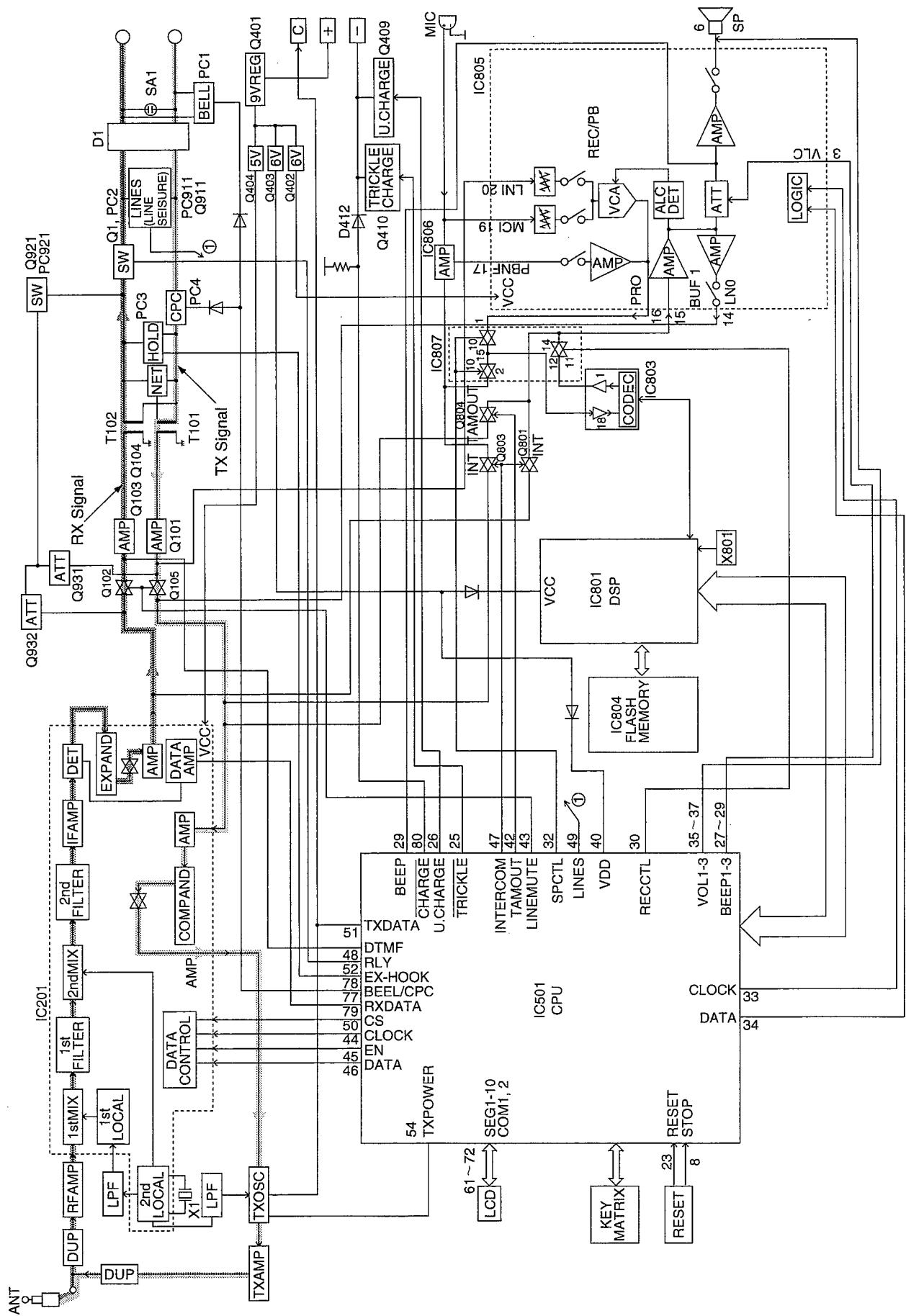


Fig. 7

## BLOCK DIAGRAM (BASE UNIT)



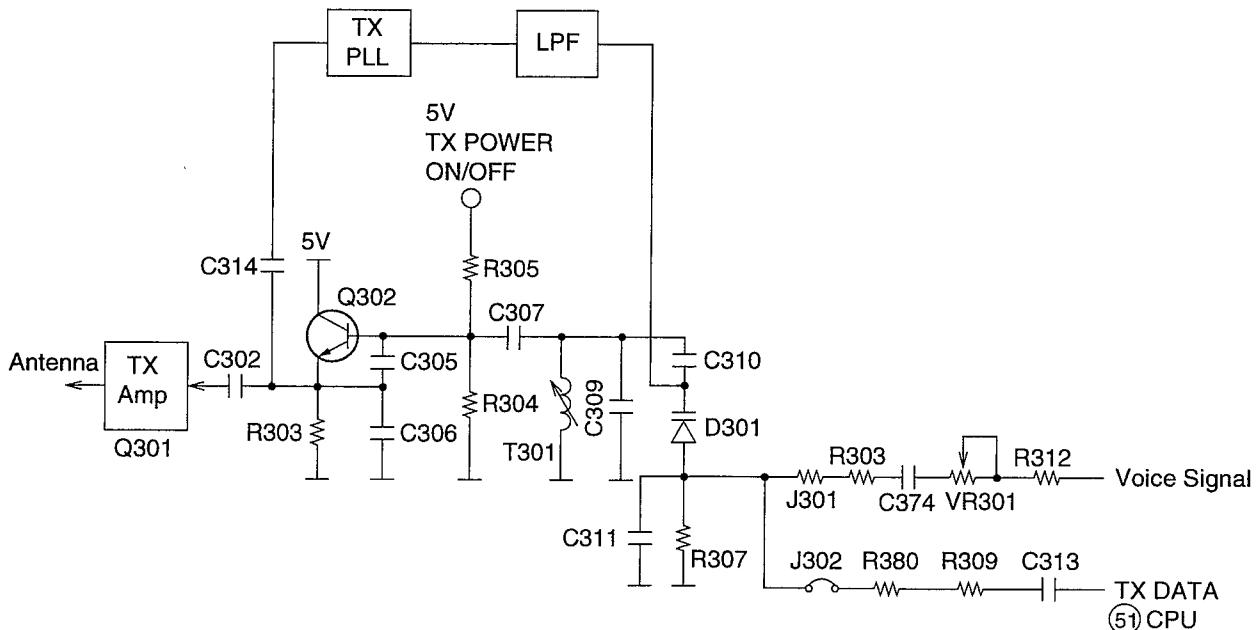
## NEW CIRCUIT OPERATION (BASE UNIT)

### ■ TRANSMITTER CIRCUIT

The voice signal or data signal sent to the handset is applied in the anode of the variable capacitor diode (VARICAP) D301, as shown on figure.

VR301 is used for changing the voice signal level, thus changing the modulation level.

**Circuit Diagram**

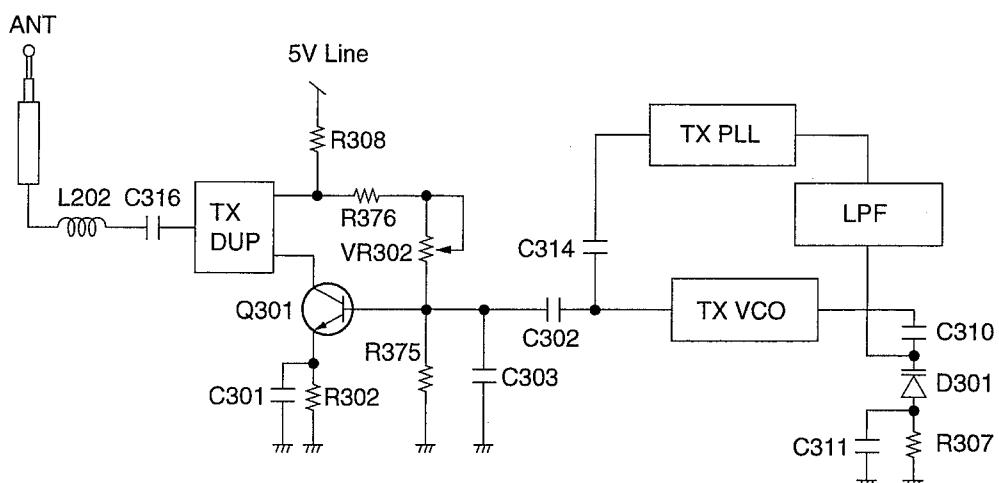


### ■ TRANSMITTER OUTPUT AMP CIRCUIT

The signal which is oscillated at TXVCO is amplified by Q301, which is biased by the TX duplexer and whose gain is adjusted by moving VR302.

The signal passes through the duplexer and it is radiated from the antenna.

**Circuit Diagram**



## ■ RECEIVER RF IF CIRCUIT

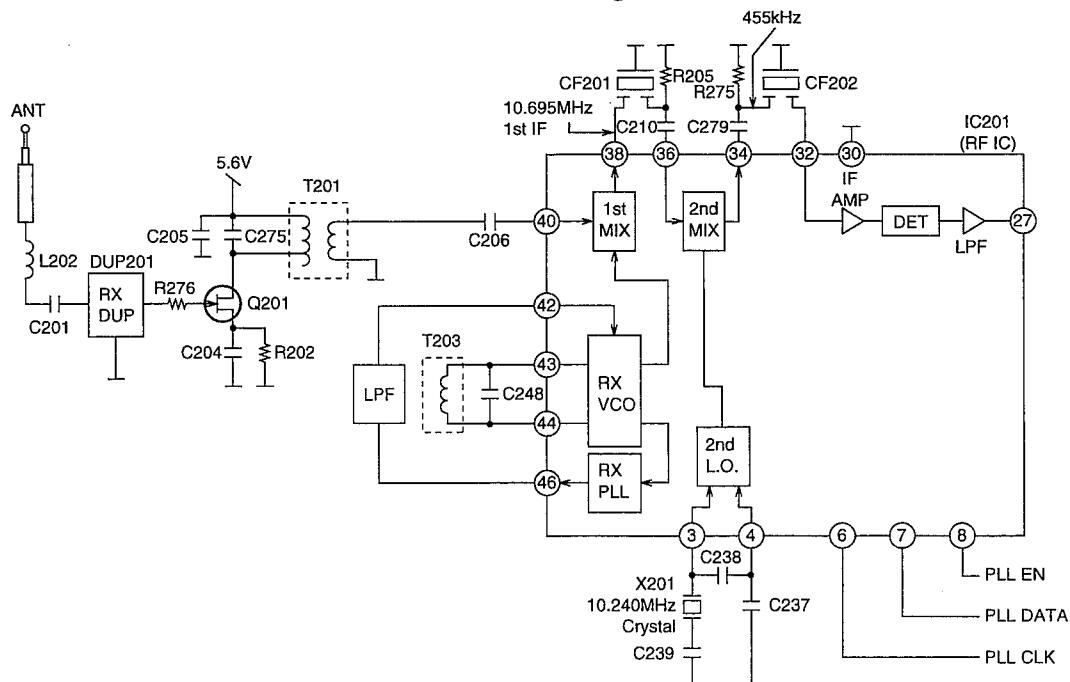
### Circuit Operation:

The signal of 49 MHz band (49.670~49.97MHz) which is input from ANT is filtered at DUP201, passes through the filter AMP of 49 MHz band at T201 and Q201, and is input to Pin 40 of IC201.

RX VCO which oscillates at T203 and Pins 42, 46 of IC201 is input to program control at inside of IC201, 1st local frequency is controlled to assigned channel by serial data which is output, from Pins 44, 45 and 46 of IC501 (CPU), makes loop with Phase Detector Out and RX VCO, and locks 1st local frequency.

The input signal of Pin 40 of IC201 and 1st local frequency output from RX VCO are mixed at inside of IC201, then it passes through CF201, and 1st IF frequency of 10.695 MHz is generated. Farther, the 10.240 MHz and 10.695 MHz which are oscillated at X201 and Pins 3, 4 of IC201 are mixed at inside of IC201 and filtered at CF202, and 2nd IF 455 Hz is output.

**Circuit Diagram**

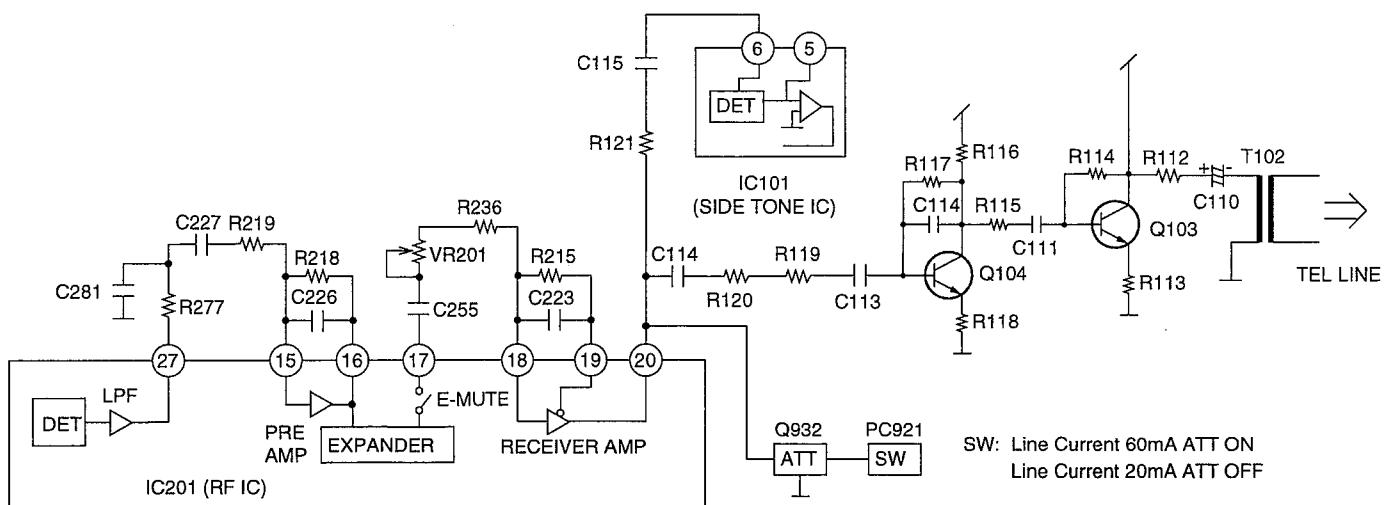


## ■ RECEIVER SIGNAL CIRCUIT

### Circuit Operation:

1. The detected signal passes through R277 → C227 → (R219) and it is input to the Pre Amplifier inside of IC201; it passes through the expander and goes out from pin 17 of IC201.
2. The signal passes through C255 → VR201 → R236, and it is input to the Receiver Amplifier of IC201, on pin 18.
3. The signal is output from the amplifier on pin 20 of IC201 and it goes through Q103 and Q104, to the telephone line.
4. The signal is also input to the IC101 (sidetone IC) in pin 6, in order to define the attenuation level of this IC.

**Circuit Diagram**



## NORMAL CIRCUIT OPERATION (BASE UNIT)

### ■ TELEPHONE LINE INTERFACE

#### Circuit Operation:

- ANSWER

In the idle mode, Q1 is open to cut the DC loop current and decrease the ring load. When ring voltage appears at the Tip (T) and Ring (R) leads (When the telephone rings), the AC ring voltage is transferred as follows:

T → SA1 → C1 → R1 → PC1 → IC501 Pin 77

When the CPU detects a ring signal, Q1 turns on, thus providing an off-hook condition (active DC current flow through the circuit) and the following signal flow is for the voice signal.

T → SA1 → D1 → Q1 → T101 Pin 6 → T101 Pin 4 → D4 → D1 → R

- ON HOOK

Q1 is open, and therefore cuts the DC loop current and cuts the voice signal. The unit is consequently in an on-hook condition.

- SPECIFICATIONS

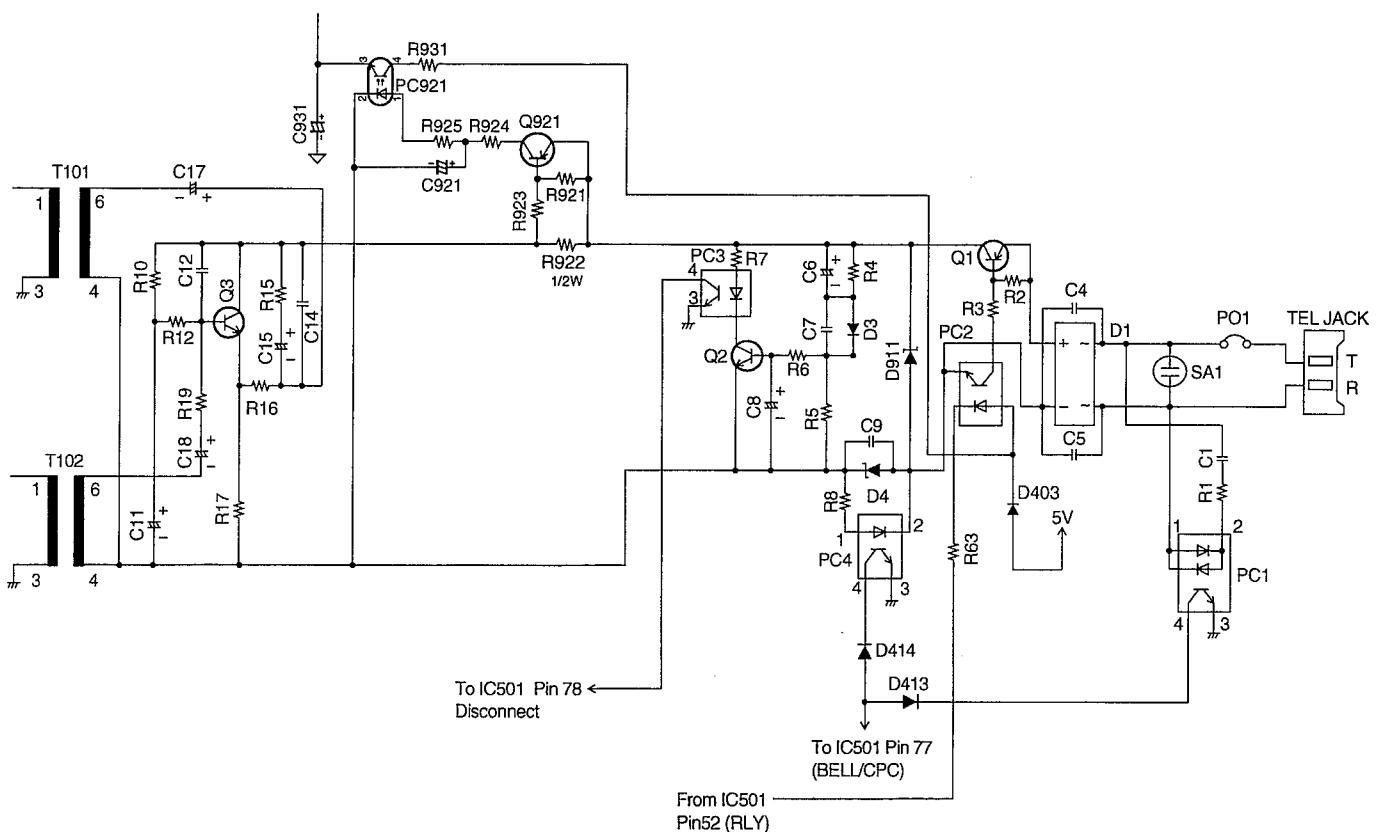
In the on-hook state (idle), the current flows between the telephone line and the unit is as follows:

T → C1 → R1 → PC1 → R

The DC component is blocked by C1; thereby providing an on-hook condition.

The AC interface impedance is over 47 kΩ; thus, satisfying the telephone company requirements.

**Circuit Diagram**



## ■ INTERCOM MODE

- 1) When the base unit PAGE/INT button is pressed, a call monitor signal of 1.95 kHz (intercom sound) is output from Pin ②7 of IC501.
- 2) At the same time, Pin ⑤4 of IC501 goes "High", and the transmission state is reached. Then the modulated data signal is output from Pin ⑤1 of IC501. Flashing of the INUSE LED (LED551) is obtained from Pin ⑦3 of IC501. This status is called "Intercom stand-by".
- 3) The receiving signal flows:  
ANT → Receiving Circuit → Pin ②0 of IC501 → Q801 (Pin ④7 of IC501 Low → High) → R838 → C837 → Pin ⑮15 of IC805 → Speaker.
- 4) The transmission signal flows:  
MIC → IC806 (Amp) [pin ⑦ is outputted] → Q803 (Pin ④7 of IC501 Low → High) → R872 → C870 → R947 → Q941 → Transmission Circuit → ANT.

## ■ INITIALIZING CIRCUIT

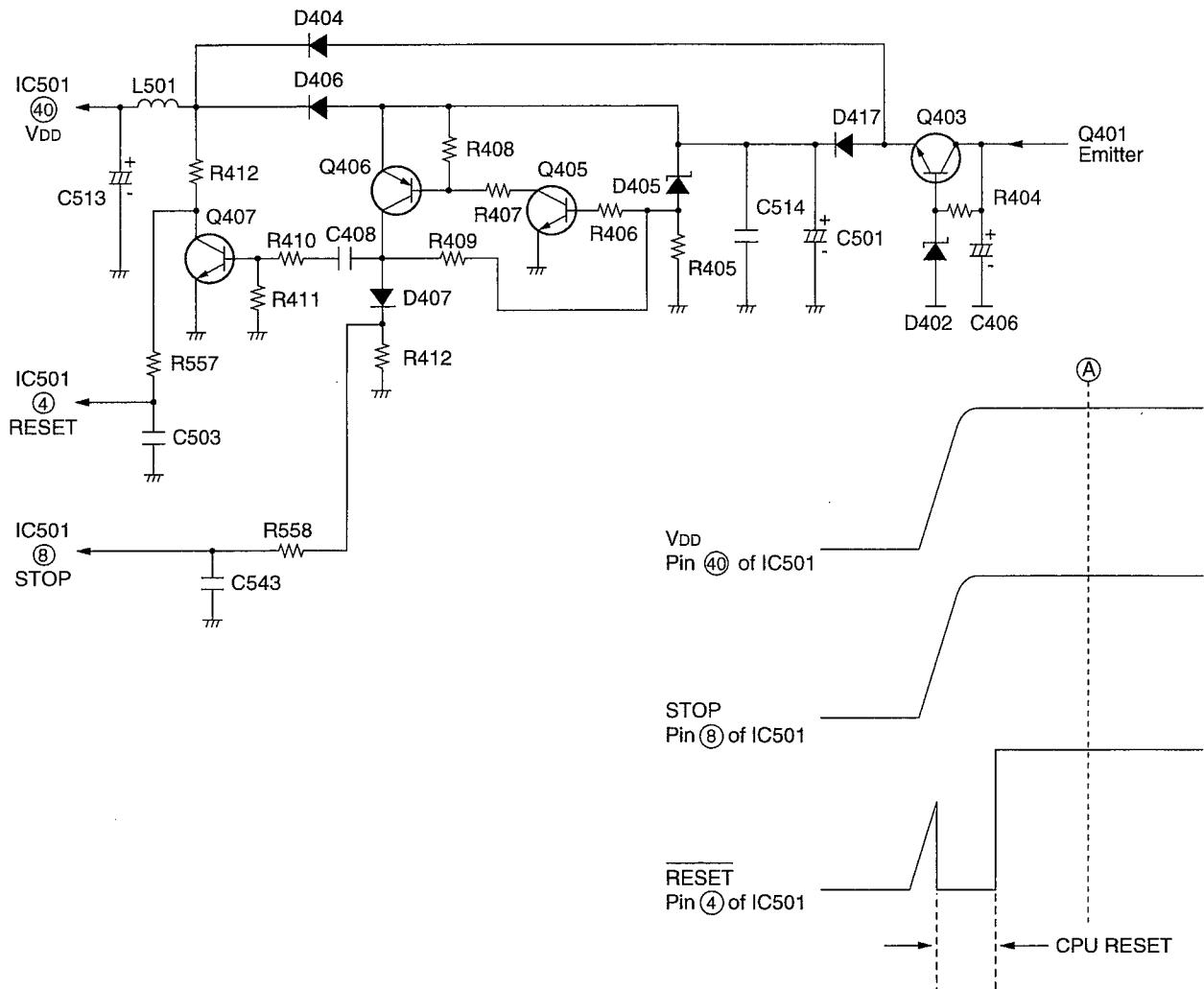
### Function:

This circuit is used for to initialize the microcomputer on "power up".

### Circuit Operation:

When the AC Adaptor is connected to the unit, then the current flows through D417 and power is supplied to the CPU. The set will then operate from point (A) in the circuit voltage diagram.

**Circuit Diagram**



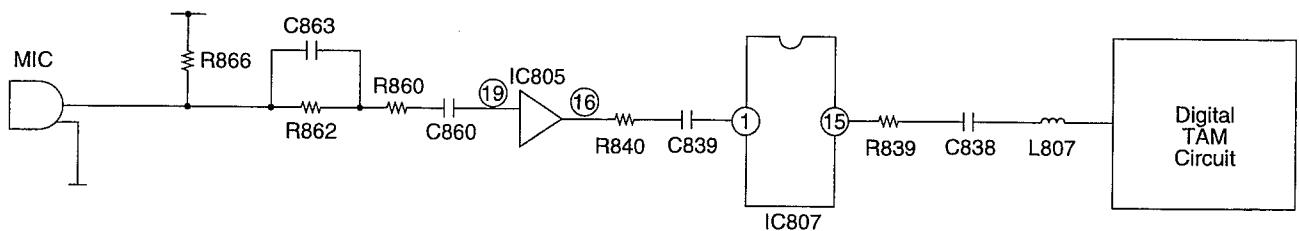
## KX-TCM416SAB

### ■ GREETING RECORDING CIRCUIT

#### Circuit Operation:

MIC → R862 → C860 → Pin 19 of IC805 → Pin 16 of IC805 → R840 → C839 → Pin 1 of IC807 → Pin 15 of IC807 → R839 → C838 → L807 → Digital TAM Circuit.

**Circuit Diagram**

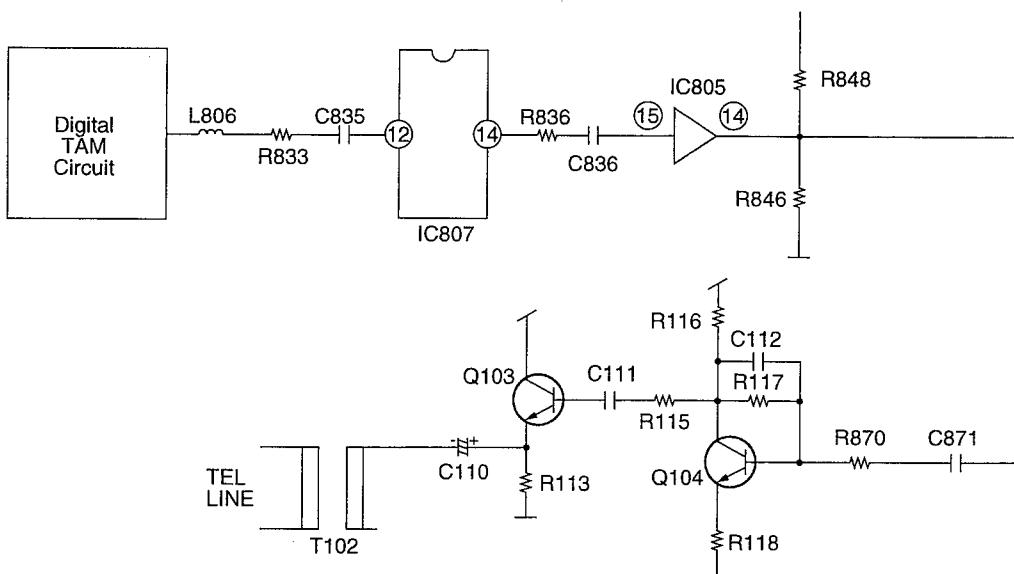


### ■ GREETING PLAY BACK CIRCUIT

#### Circuit Operation:

Digital TAM Circuit → L806 → R833 → C835 → Pin 12 of IC807 → Pin 14 of IC807 → R836 → C836 → Pin 15 of IC805 → Pin 14 of IC805 → C871 → R870 → base of Q104 → collector of Q104 → Base of Q103 → emitter of Q103 → C110 → T102 → Telephone Line.

**Circuit Diagram**

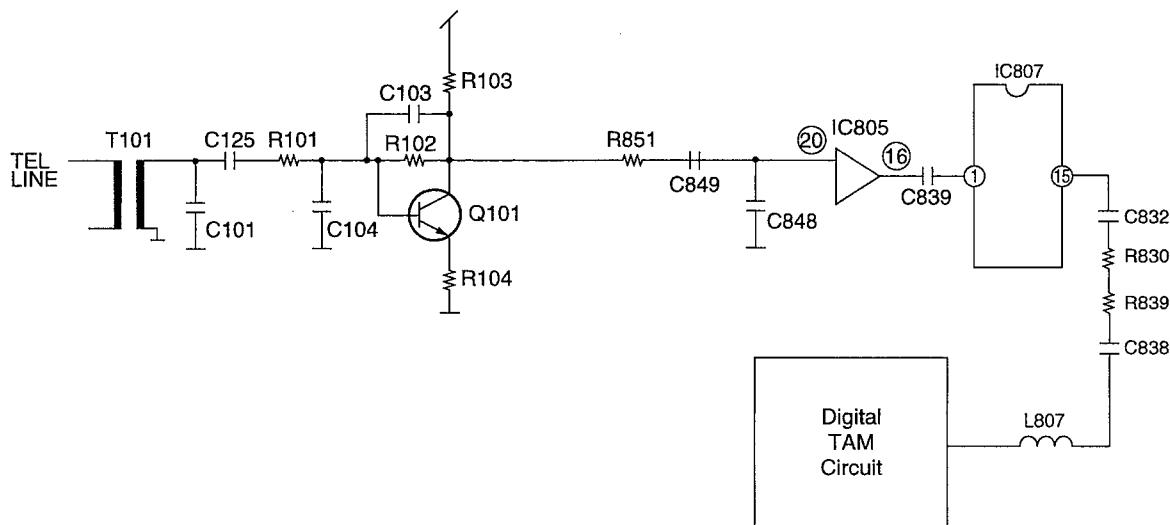


## ■ ICM RECORDING CIRCUIT

### Circuit Operation:

Telephone Line → T101 → C125 → R101 → Q101 → R851 → C849 → Pin ⑩ of IC805 → Pin ⑯ of IC805 → C839 → Pin ① of IC807 → Pin ⑮ of IC807 → C832 → R830 → R839 → C838 → L807 → Digital TAM Circuit.

**Circuit Diagram**

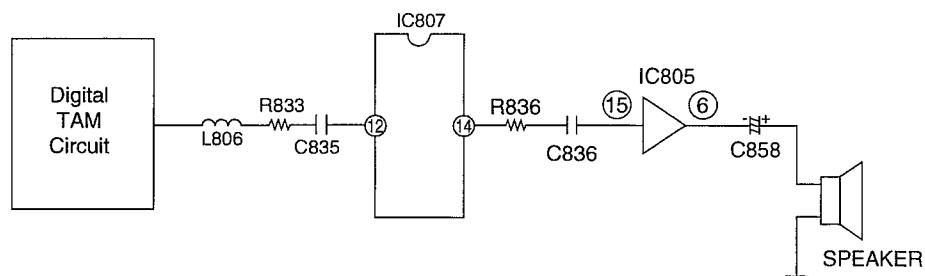


## ■ ICM PLAY CIRCUIT

### Circuit Operation:

Digital TAM Circuit → L806 → R833 → C835 → Pin ⑫ of IC807 → Pin ⑭ of IC807 → R836 → C836 → Pin ⑮ of IC805 → Pin ⑥ of IC101 → C858 → Speaker.

**Circuit Diagram**



## KX-TCM416SAB

### ■ AUTO DISCONNECT CIRCUIT

#### Function:

This circuit is used to detect the fact that another telephone connected to the same line is OFF-HOOK while the unit is in a receiving status or OGM transmitting status.

#### Circuit Operation:

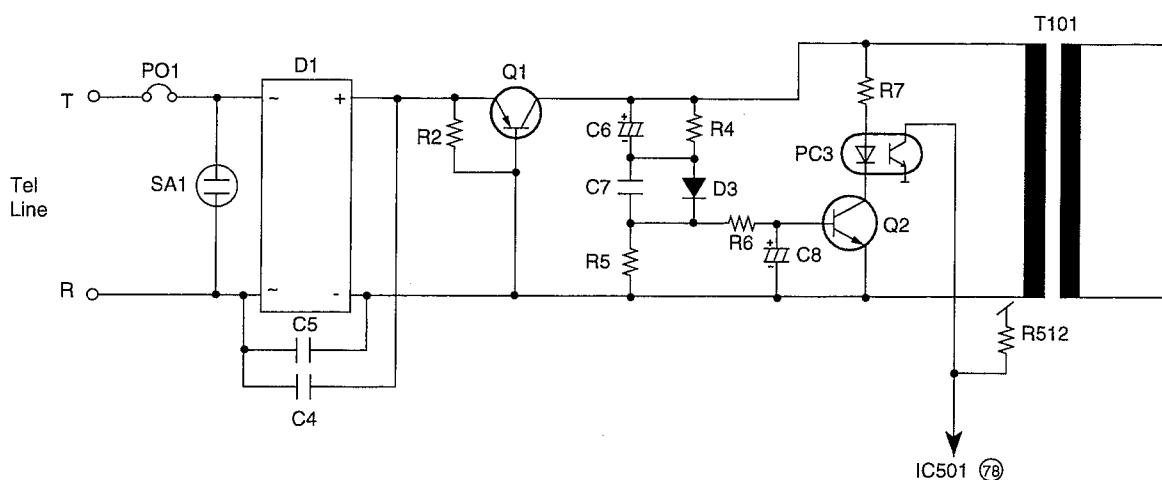
T → PO1 → D1 → Q1 → R4 → D3 → R6 → Q2. During this interval C8 charges and the base of Q2 becomes High, causing Q2 to go ON.

If a parallel-connected telephone is put into an OFF HOOK status, charge ceases to flow to C6, and the base of Q2 becomes Low, causing Q2 to go OFF.

However, the system is designed so that if the voltage fluctuation is small, the charging and discharging of C8 has no effect on the system.

When a line is connected, Q2 goes ON, causing Pin 78 of IC501 to go low. When the line is disconnected, Q2 goes off, causing Pin 78 of IC501 to go high.

**Circuit Diagram**



### ■ POWER SUPPLY CIRCUIT

#### Function:

Power from the AC adaptor passes through a 2-stage regulating block consisting of Q401, Q402, Q403 and Q404 and provides system voltages of 5.4 and 9 V.

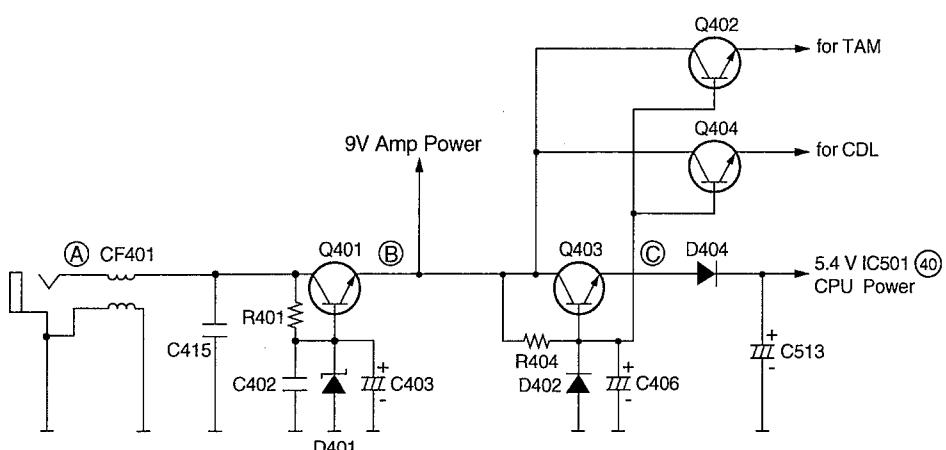
#### Circuit Operation:

Q401 is a regulated power supply. The voltage at point (B) is regulated to 9 V by the zener voltage of D401 → Amp power.

Q402, Q403 and Q404 are a regulated power supply. The voltage at point (C) is regulated to 6 V by the zener voltage of D402.

The 6 V voltage is dropped by D414 to 5.4 V.

**Circuit Diagram**



## ■ SPEECH/SIGNAL PROCESSING CIRCUIT

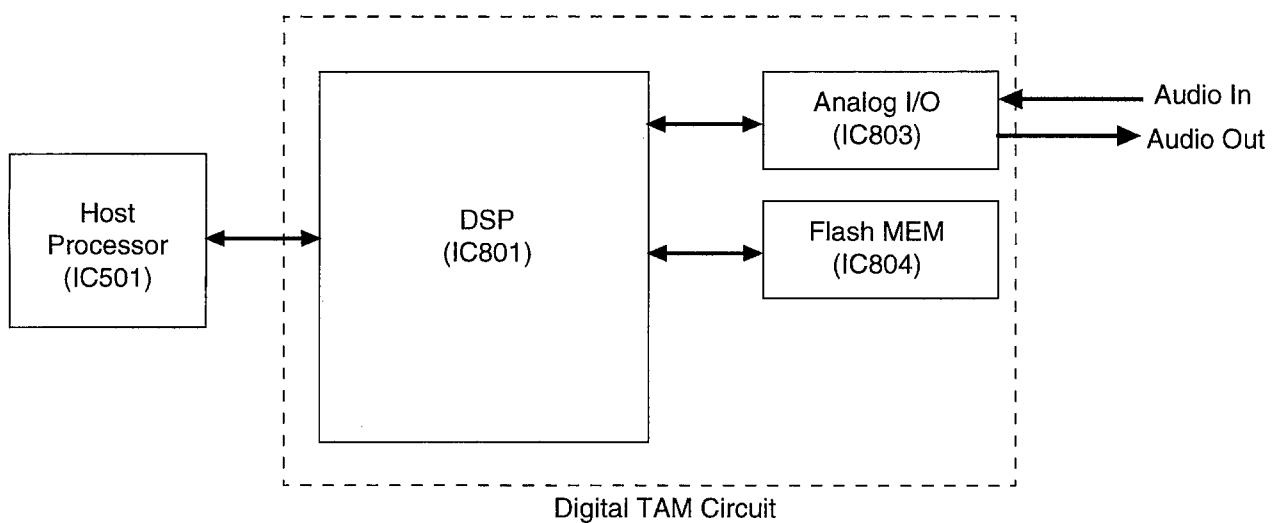
### General Description:

IC801~IC804 are a speech/signal processing system that implements all the functions of speech compression, record and playback, and memory management required in a digital telephone answering machine.

The DSP system is fully controlled by a host processor (IC501), via 8 bit interface. The host processor provides activation and control of all that functions, such as speech Recording, Playback, Tone detecting and Line Monitoring.

The DSP system comprises of following.

- a Digital Signal Processor which includes the firmware implemented functions.
- a Codec (IC803), which is used as the analog I/O interface.
- an Audio grade Flash MEM (IC804), which is used for stored voice messages, and Synthesized Voice.



### • Voice Message Recording

The DSP system use a proprietary speech compression technique to record and store voice message in the Flash MEM (IC804). An error correction algorithm is used to enable playback of these messages from the Flash MEM.

### • DTMF Detection

The DTMF detection is implemented by the DSP system in software. The DTMF detection is performed during Record, Playback, and Line Monitoring modes of operation.

### • Synthesized Voice

The DSP implements synthesized Voice, utilizing the built in speech detector and an external Flash MEM (IC804), which stored the vocabulary.

## KX-TCM416SAB

### ■ CPC (CALLING PARTY CONTROL) DETECTOR CIRCUIT

#### Function:

The CPC DETECTOR complements the units shut off, in the ANSWER mode, after the caller hangs up. At this time, the CPC DETECTOR takes over.

The CPC DETECTOR senses the temporary disconnection of the telephone line which occurs after the caller hangs up.

#### Circuit Operation:

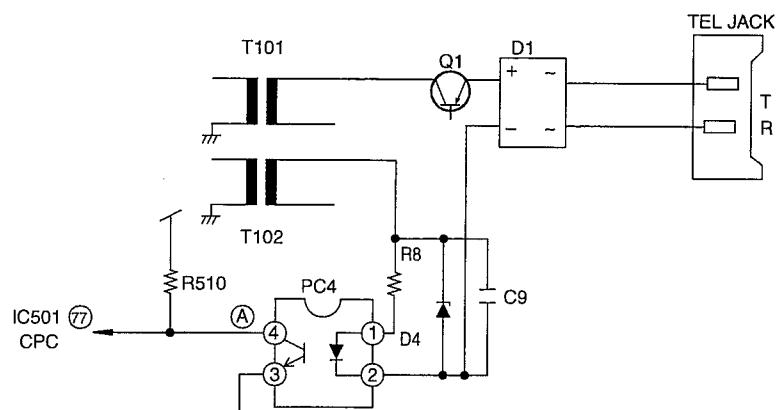
When off-hook, the DC current of telephone line flows as follows:

T → D1 → T101 → R8 → PC4 → D1 → R

When in the off-hook mode, the collector of PC4 is at Low level.

If an momentary break of the telephone line occurs, the collector of phototransistor goes to a high level from a low level.  
(The CPC detector is designed for the momentary break of more than 8 msec. or 600 msec.).

**Circuit Diagram**



**CPC Function**

	A	B
OK	more than 8 ms	more than 600 ms
NG	less than 5 ms	less than 350 ms

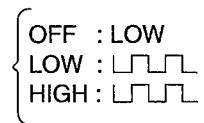
between  
T and R

Ⓐ waveform

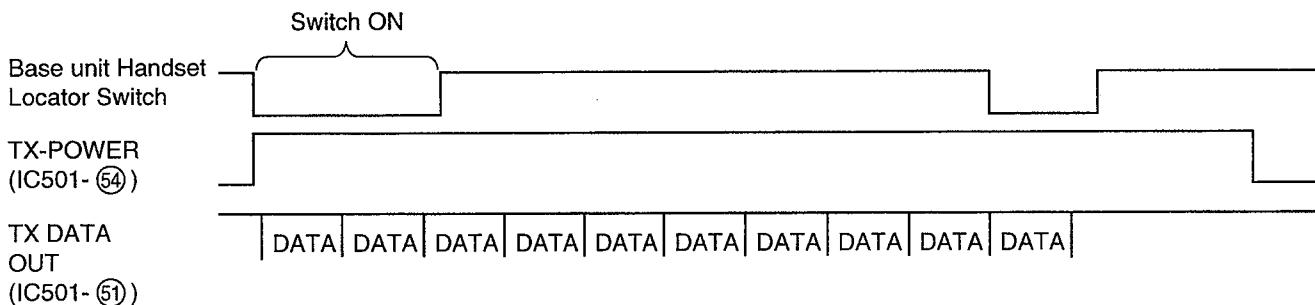
## ■ CPU OPERATION

### 1. TEL MODE

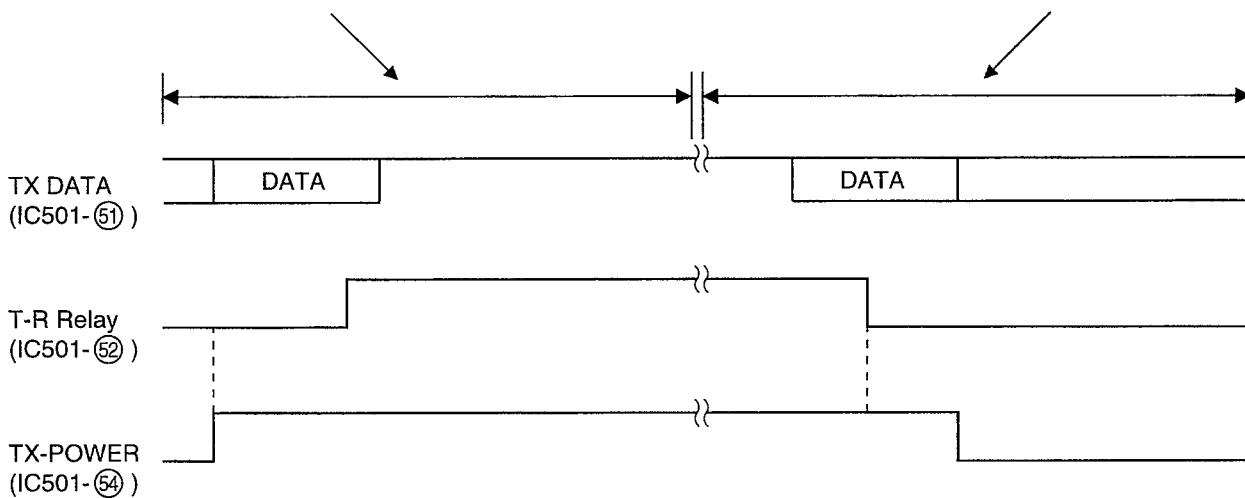
CPU Terminals Operation Mode	54 TX POW	51 TX DATA	52 TR-RLY	27 BEEP
STANDBY	L	H	H	L
TALK	H	H	L	L
Handset→Base Unit Paging	H	DATA OUTPUT	H	□□□
Base Unit→Handset Ring	H	DATA	H	L □
Base Unit→Handset Paging	H	DATA	H	□□□
CHARGE	L	DATA	H	L
CH Changing (TALK)	H	DATA	L	L

The base unit mode is : 

### 2. TIMING OF IC501 (CPU) OUTPUT PORT WITH THE BASE UNIT IN HANDSET LOCATOR MODE



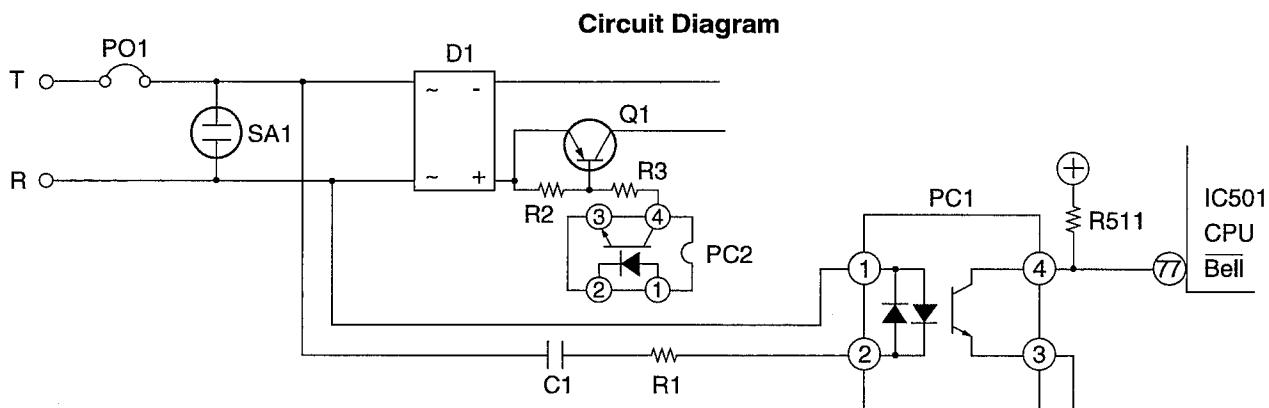
### 3. WHEN PRESSING THE TALK BUTTON OF THE HANDSET



### 4. THE HANDSET TO OFF

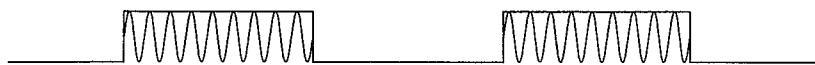
## KX-TCM416SAB

### 4. RESONANCE PREVENTION CIRCUIT



Ring signal

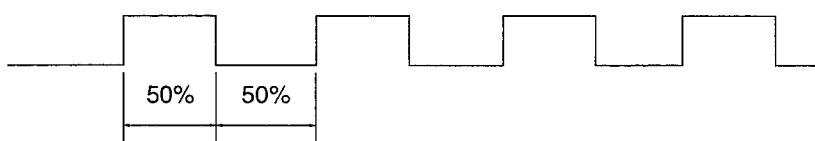
• T-R



• PC1-①



• PC1-④



Make/break ratio when dialing with the handset: 40%: 60%

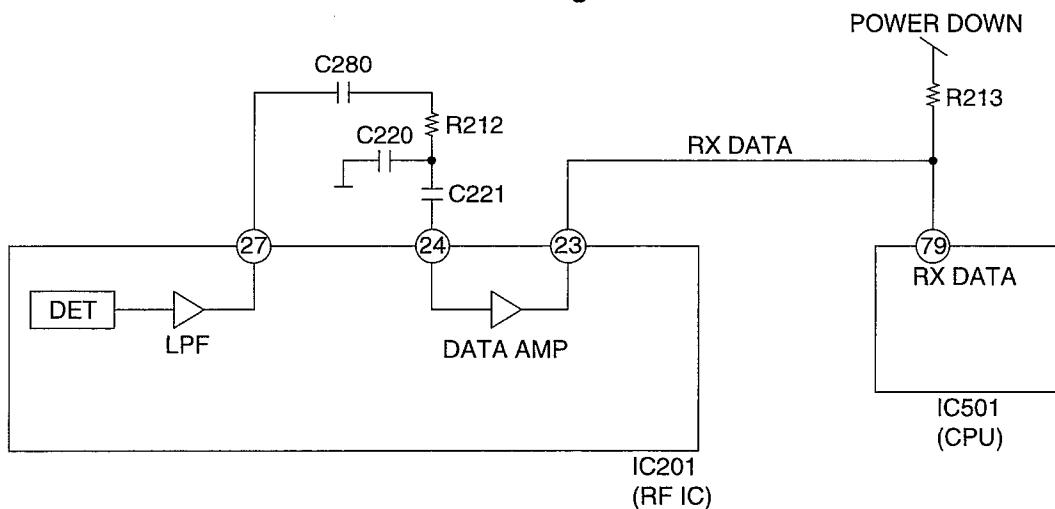
High/low ratio upon ring signal: 50%: 50%

Therefore, if the low/high ratio is greater than 45% at IC501- 77 (CPU), it is judged as a ring signal.

### 5. EXPLANATION OF THE DATA RECEPTION CIRCUIT

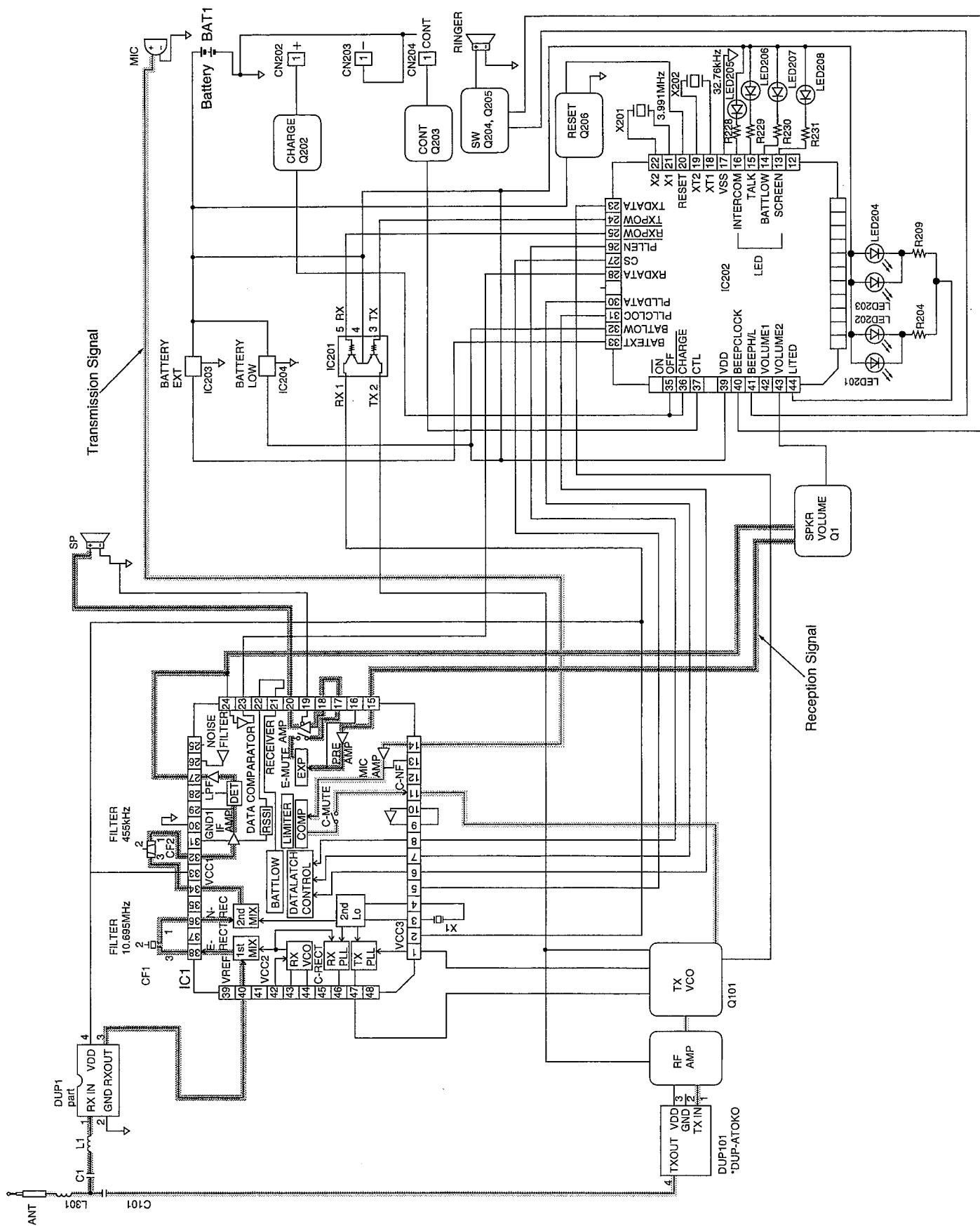
#### 5-1. Signal Flow

**Circuit Diagram**



In area where the transmission power from the handset is extremely weak, noise is superimposed on the data and the chance of an error is high upon reception of the data. To help prevent this, the above circuit is used.

## BLOCK DIAGRAM (HANDSET)



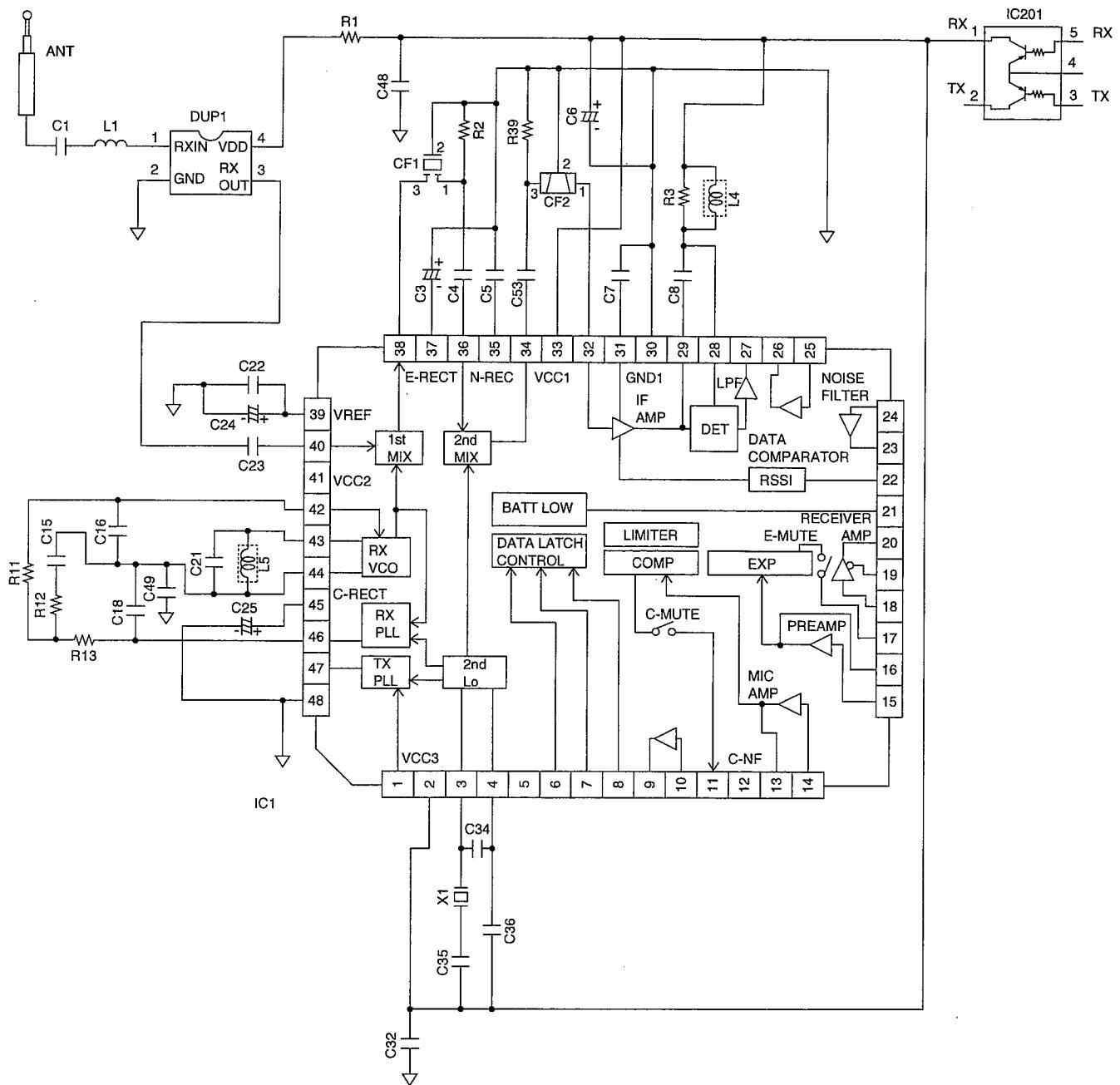
## NEW CIRCUIT OPERATION (HANDSET)

### ■ RECEIVER RF IF CIRCUIT

#### Circuit Operation:

The signal of 46 MHz band (46.61 MHz~46.97 MHz) which is input from ANT is filtered by DUP1, and is input to Pin 40 of IC1. The RX VCO which oscillates at L5 and IC1 is locked to 1st Local frequency by PLL inside IC1. (PLL is controlled by serial data output from Pin 26, 30 and 31 of IC202.) An input signal from Pin 40 of IC1 and 1st Local frequency output from RX VCO are mixed inside IC1, pass through CF1, and 1st IF frequency of 10.695 MHz is generated. Further, 10.240 MHz and 10.695 MHz oscillated at X1, pass through MIXER inside IC1 and are filtered at CF2 and output 2nd IF 455 kHz.

**Circuit Diagram**



## ■ RECEIVER SIGNAL CIRCUIT

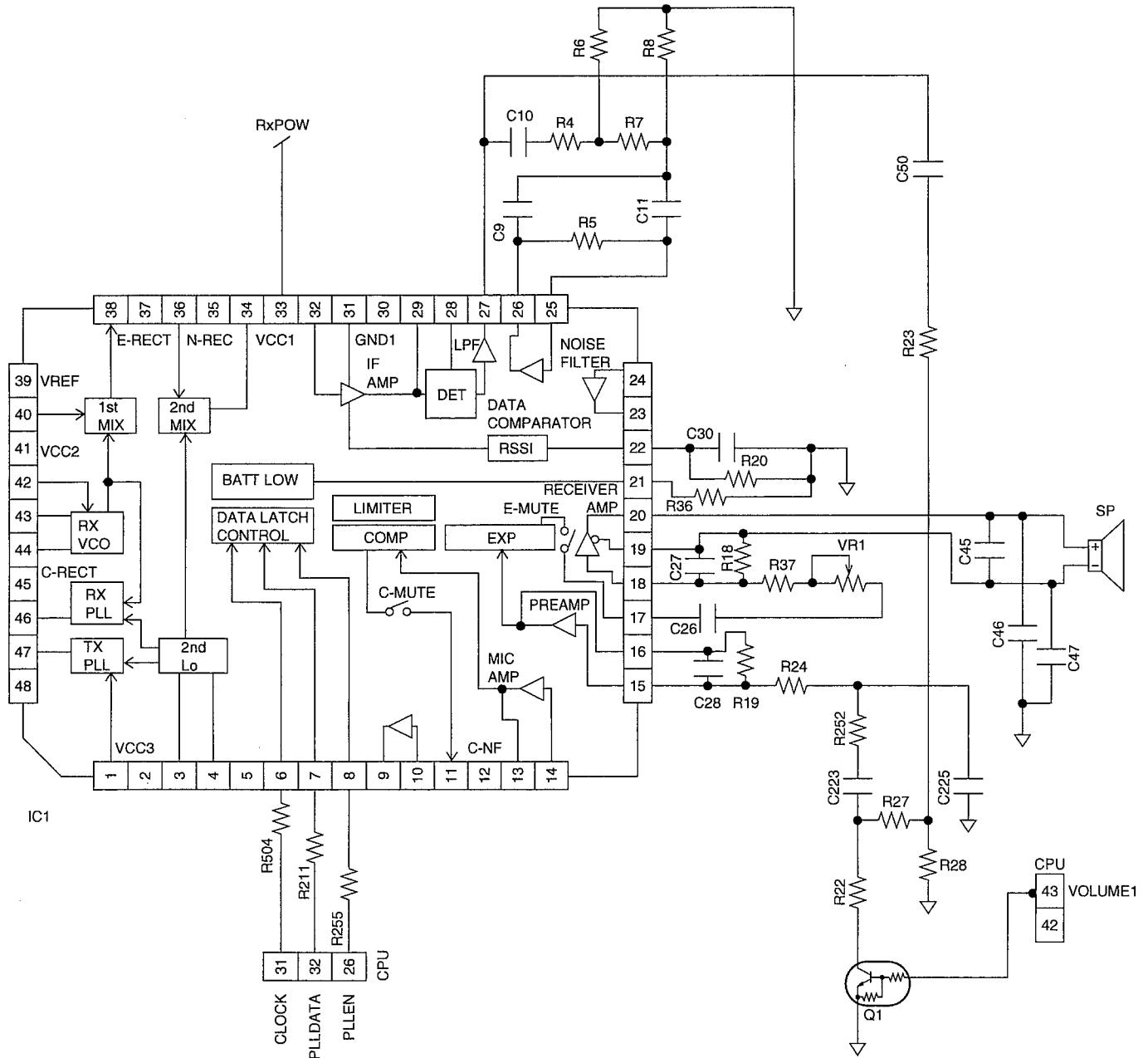
## Circuit Operation:

After getting the 455kHz signal, it is input to Pin 32 of IC1 and passes through IF AMP and Detector Circuit are output to Pin 27. It is an AF signal flows through C50, R23. Its level is switched by Q1 which is controlled by the CPU.

The signal is received at Pin 15 of IC1, then it passes through the following circuits: PREAMP, Expander and Amplifier. It goes out at Pin 20 and finally is sent to the SP.

Inside IC1, E-MUTE, C-MUTE and PLL circuits are controlled by the serial data from the CPU (from Pins 26, 31 and 32).

## Circuit Diagram

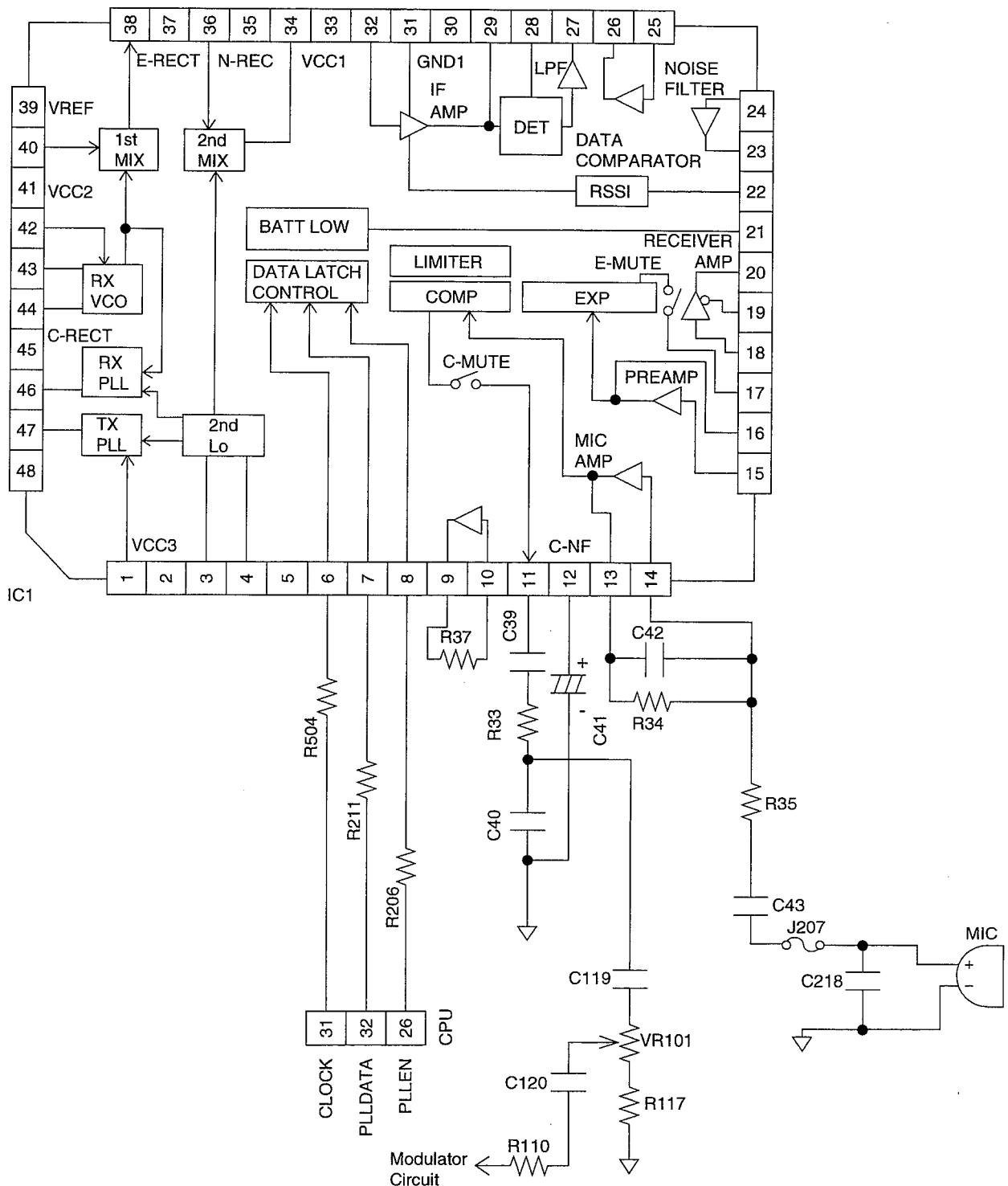


**■ TRANSMITTER SIGNAL CIRCUIT**

**Circuit Operation:**

Input signal from MIC passes through the filters arranged by C43, R35 and C42, R34 and it is input to the Pin 14 of IC1. Inside it, the signal passes through the MIC AMP and Compressor circuits and is output to Pin 11. It flows through C39, R33, C119 and VR101, then is input to modulator circuit.

**Circuit Diagram**

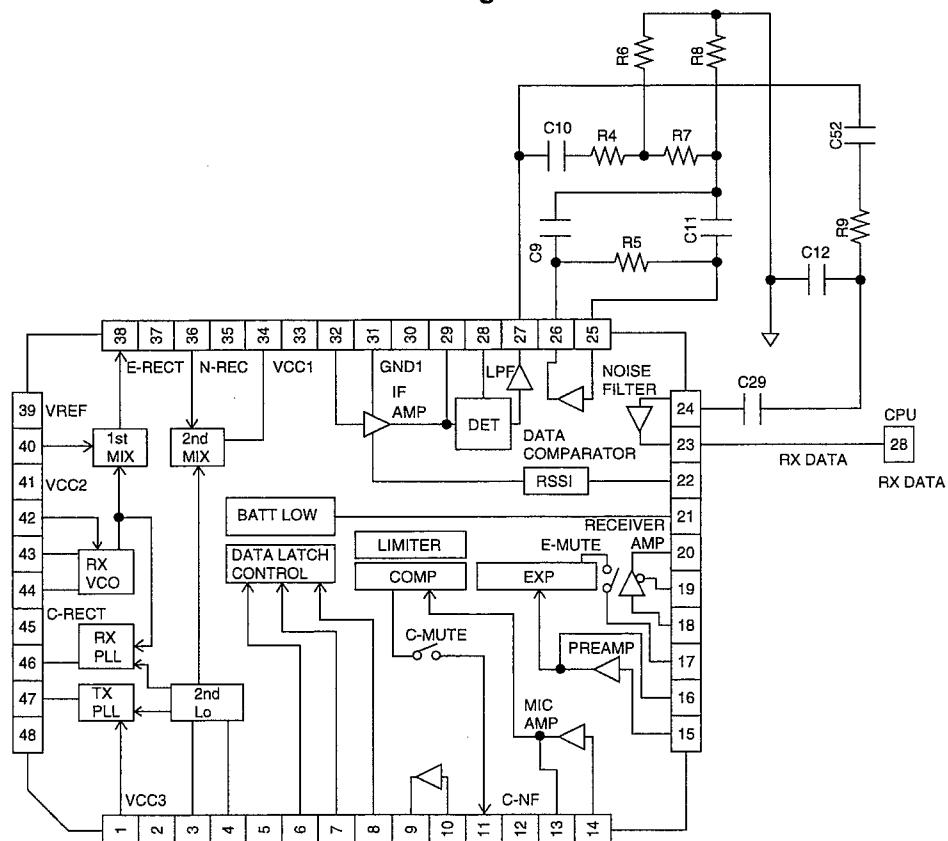


## ■ RECEIVER DATA CIRCUIT

### Circuit Operation:

Only the data received is passed through the low pass filter formed by R9 and C12 to be input at pin 24 of IC1, where the waveform is adjusted. The resulting signal is output from Pin 23 and sent to CPU directly.

**Circuit Diagram**



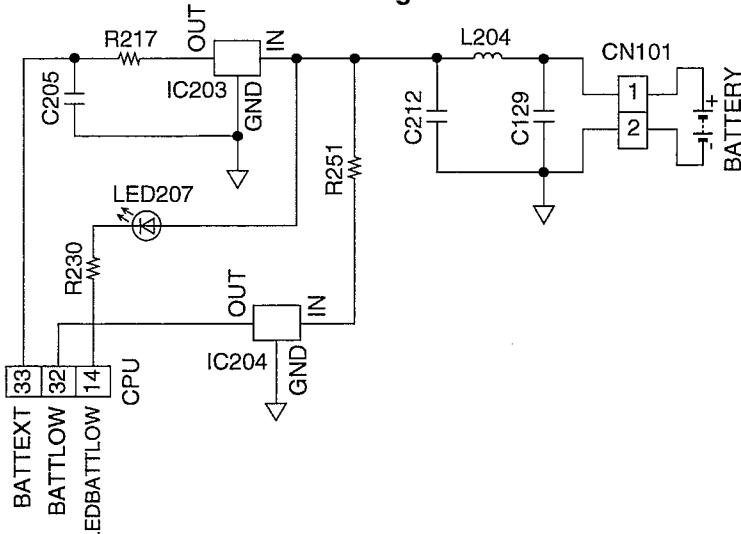
## ■ BATTERY LOW DETECTOR CIRCUIT

### Circuit Operation:

When the battery voltage reduces to less than 3.55V, this level is detected at the input of IC 204, so its output switches from a high state to low state. The CPU detects this level at Pin 32 and battery low indicator lights starts flashing.

The IC203 monitors the level of the battery, if this level is less than 3.0V, the output of IC203 switches to low state, then CPU stops working to maintain memory.

**Circuit Diagram**



## NORMAL CIRCUIT OPERATION (HANDSET)

### ■ CPU OPERATION

CPU Terminals	23 TX DATA	25 RX POW	24 TX POW	41 BEEP	15 TALKLED
Operation Mode					
STANDBY	L	Intermittently H or L	H	H	H
TALK	L	L	L	H	L
Base Unit→Handset Ring	-	L	H	L	FLASHING
Base Unit→Handset Paging	-	L	H	L	H
CHARGE	L	H	H	H	H
During (TALK)	-	L	L	H	L
Handset PULSE DIAL	DATA	L	L	H	FLASHING
Handset TONE DIAL	DATA	L	L	H	L
Handset OFF MODE	L	H	H	H	H

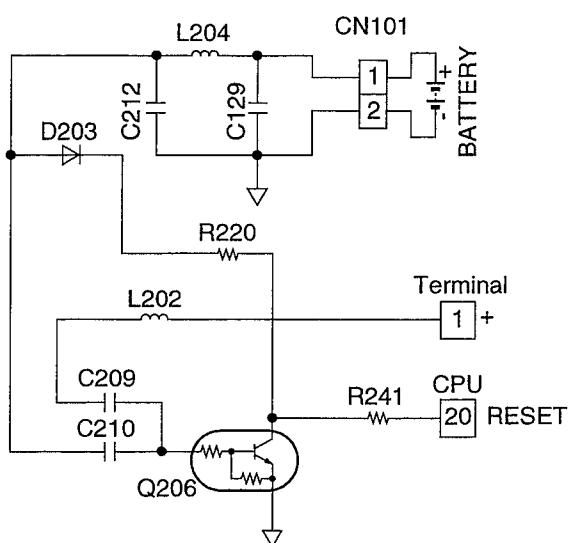
### ■ RESET CIRCUIT POWER ON/OFF CIRCUIT

#### Reset circuit

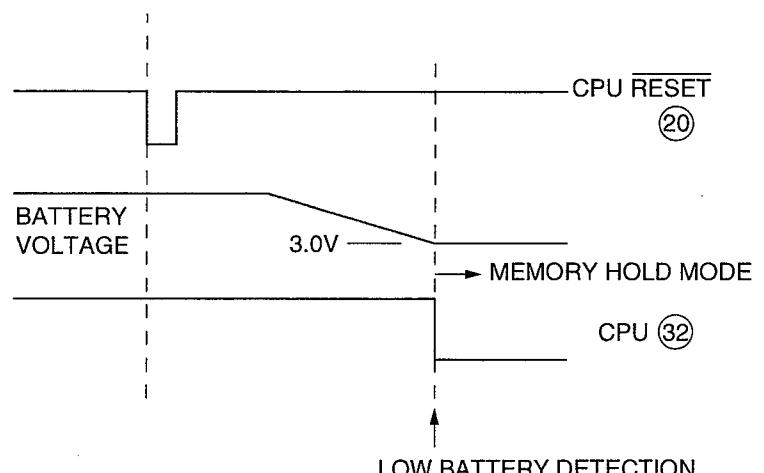
There are two ways to reset CPU.

1. When the battery is connected, there is an impulse through C210 then Q206 generates an reset signal which is received in Pin ②0 of CPU.
2. When the handset is charged, the impulse is sent through C209,Q206 generates the reset signal and it is sent to Pin ②0 of CPU.

**Circuit Diagram**



**Timing Chart**



## TROUBLESHOOTING GUIDE

Symptom	Refer to page -.	Unit for repair
The base unit does not respond to a call from handset.	24, 25	Base Unit
The base unit does not transmit or the transmit frequency is off.		
The transmit frequency is off.		
The transmit power output is low, and the operating distance between base unit and handset is less than normal.		
The reception sensitivity of base unit is low with noise.		
The transmit level is high or low.		
The reception level is high or low.		
The unit does not link.		
The In Use/Charge indicator does not flash.	57, 58	
The charge indicator does not light.	58	
The beep is not heard from the handset.	58	
No power/dead.	59	
Does not record.	60	
Does not playback.	60	
The synthesized voice will not playback.	61	
End of message is clipped when caller hangs up.	61	
The setting of battery low indicator is wrong.	34	Handset
The base unit does not respond to a call from handset.		
The base unit does not transmit or the transmit frequency is off.		
The transmit frequency is off.		
The transmit power output is low, and the operating distance between base unit and handset is less than normal.		
The reception sensitivity of base unit is low with noise.		
Does not link between base unit and handset.		
The reception level is high or low.		
The transmission level is high or low.		
After stand-by mode, the handset does not enter the battery save mode.	63	
The beep is not heard on the handset.	64	
The TALK indicator does not flash.	64	

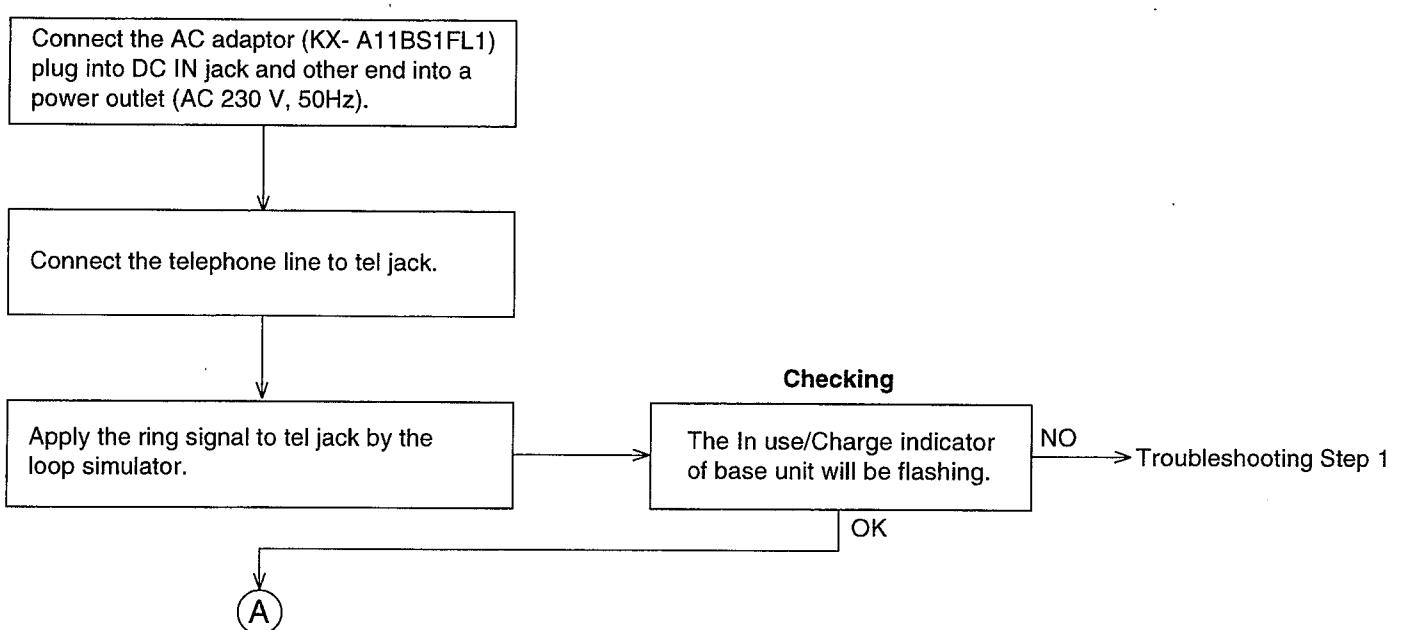
## TROUBLESHOOTING GUIDE (BASE UNIT)

**Base Unit Condition:**

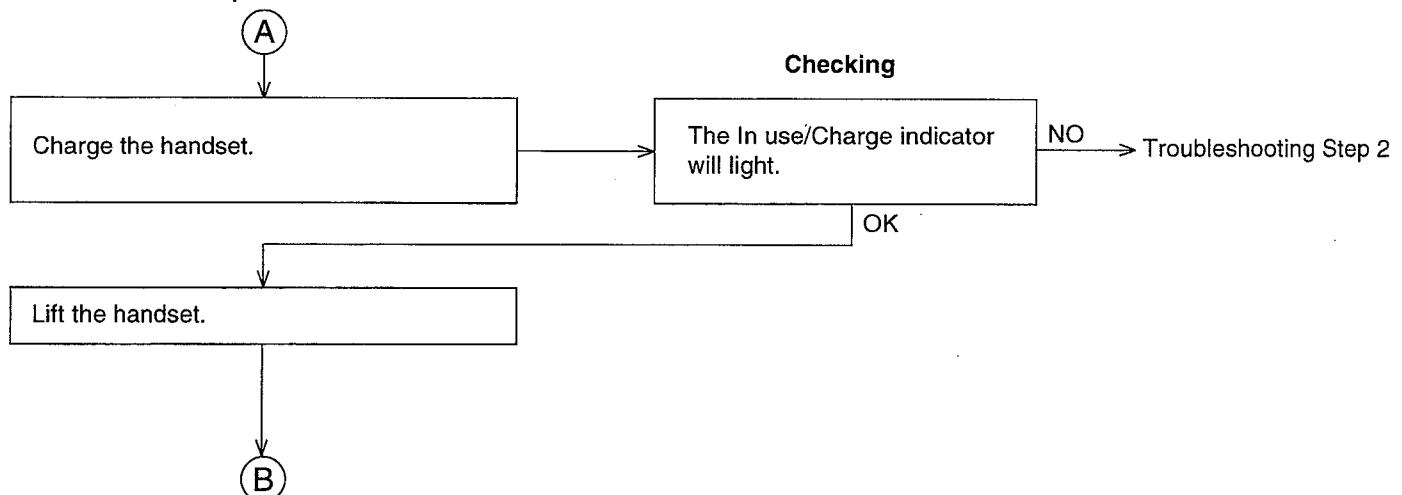
1. Set the Volume/Ringer button to "MAX".
2. Set the dialing mode to "Tone" as procedure of Selecting the Dialing Mode on page 6.

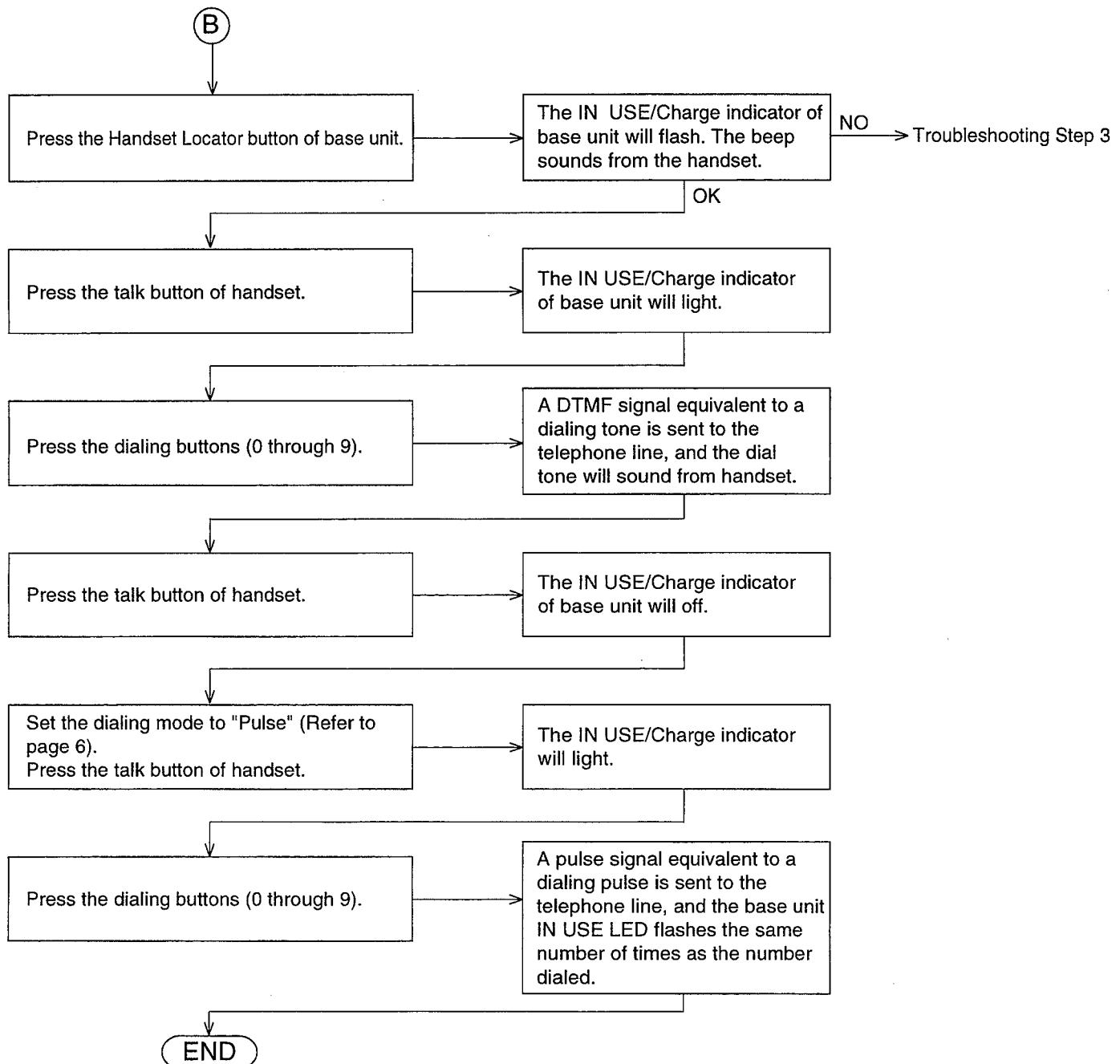
**When checking the base unit only**

Check the base unit as shown by following below flow chart.

**Operation**


**When checking the base unit and handset**

**Operation**


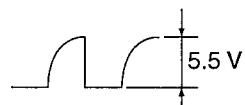
**Troubleshooting Step 1:**

The In Use/Charge indicator (LED551) does not flash.

Check the ring detector circuit.

**Check Point**

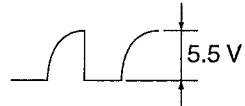
1. Pin ④ of PC 1 output voltage.



Check IC501 (CPU).

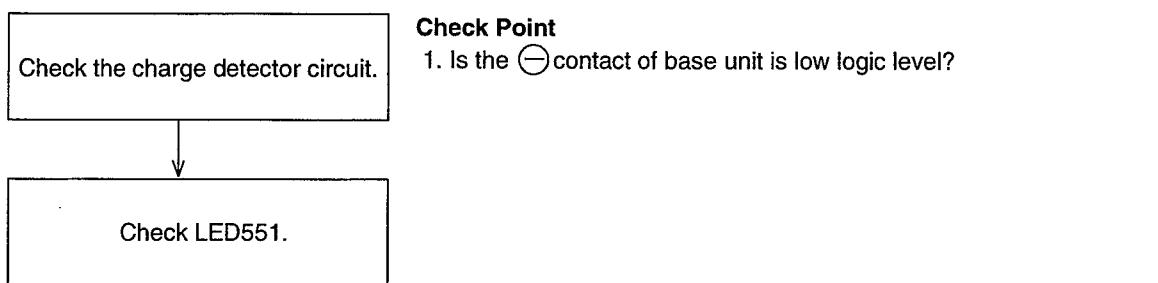
**Check Point**

1. Pin ⑦ of IC501 ring input voltage.



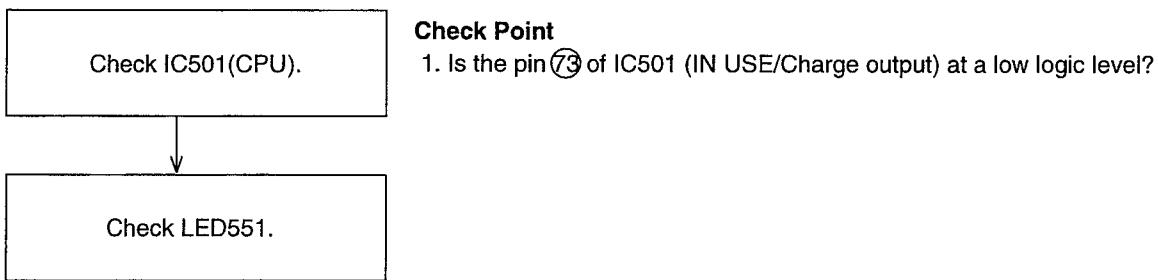
## KX-TCM416SAB

**Troubleshooting Step 2:** The charge indicator does not light.

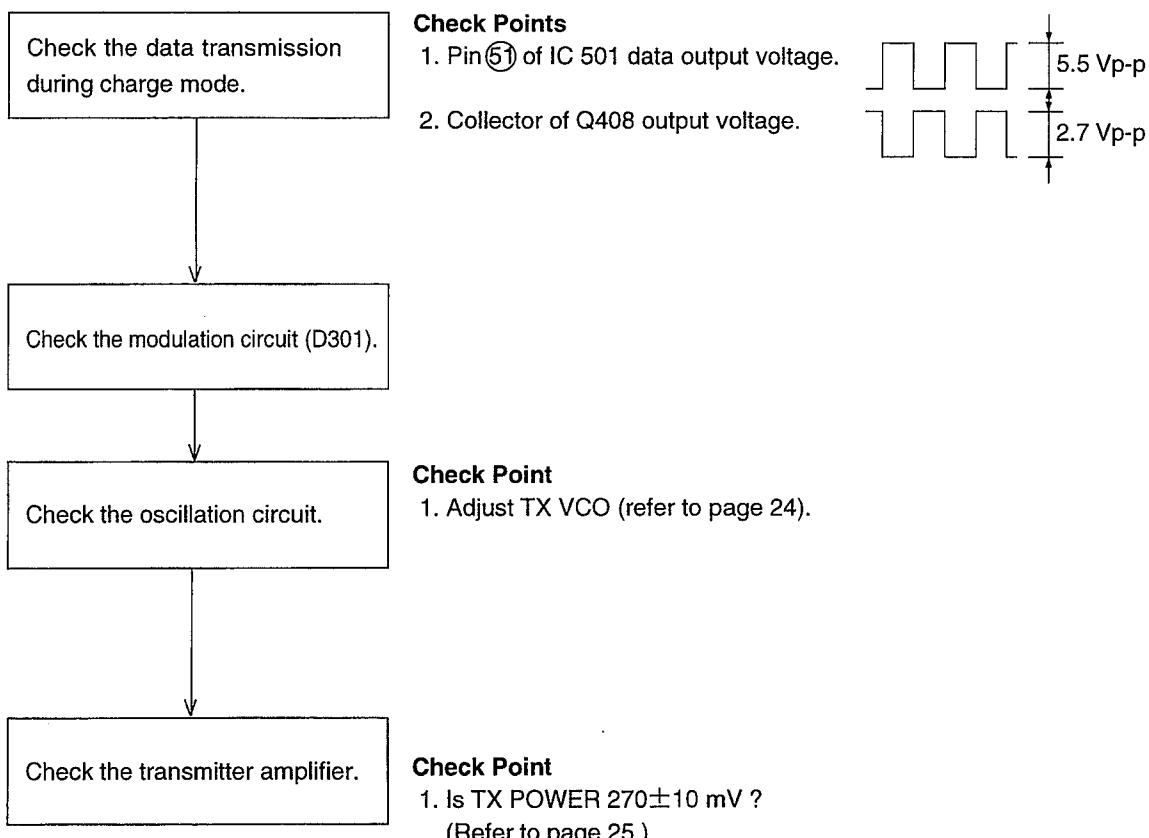


**Troubleshooting Step 3:**

1) The IN USE/CHARGE indicator does not flash.

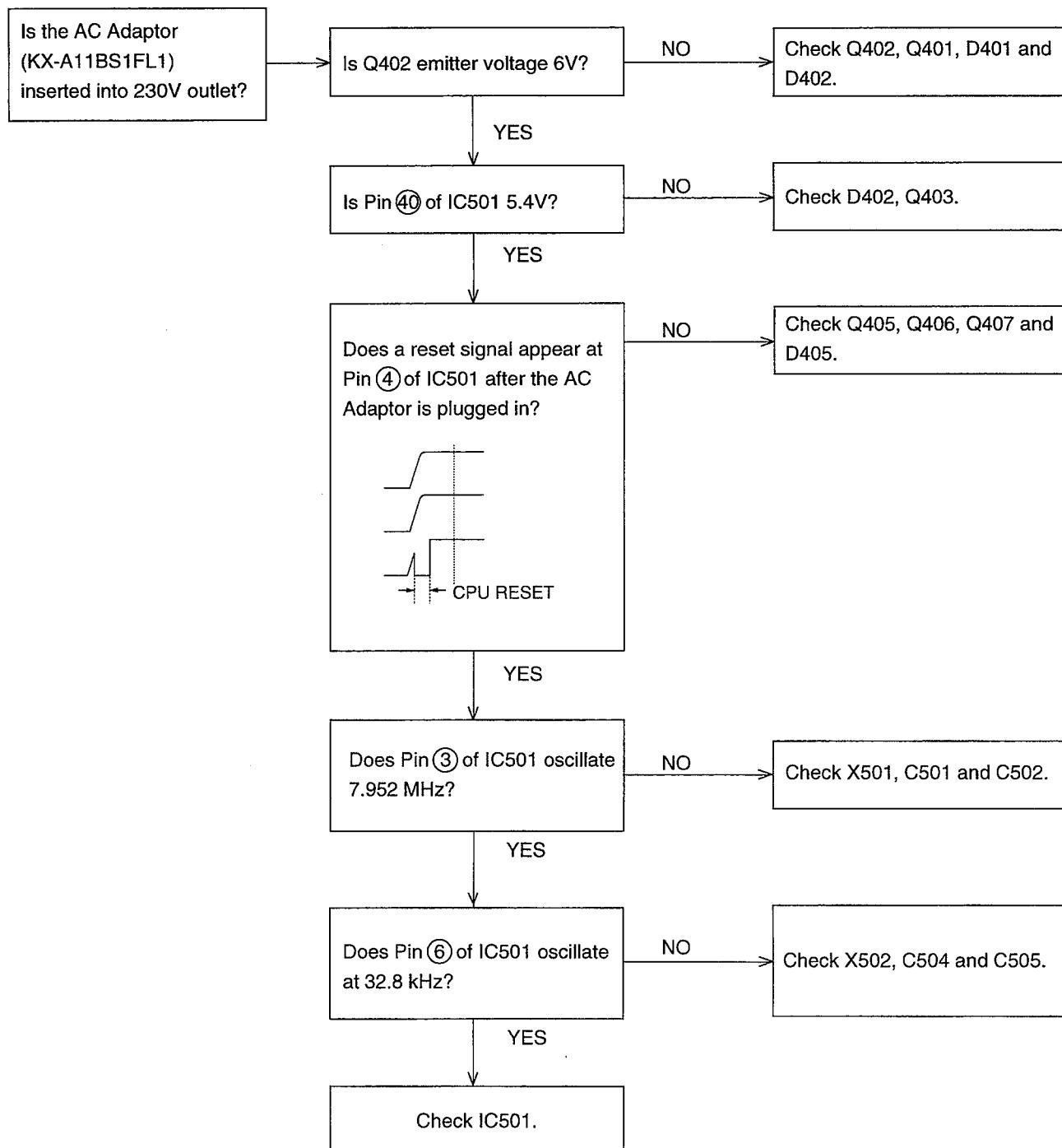


2) The beep is not heard from the handset.



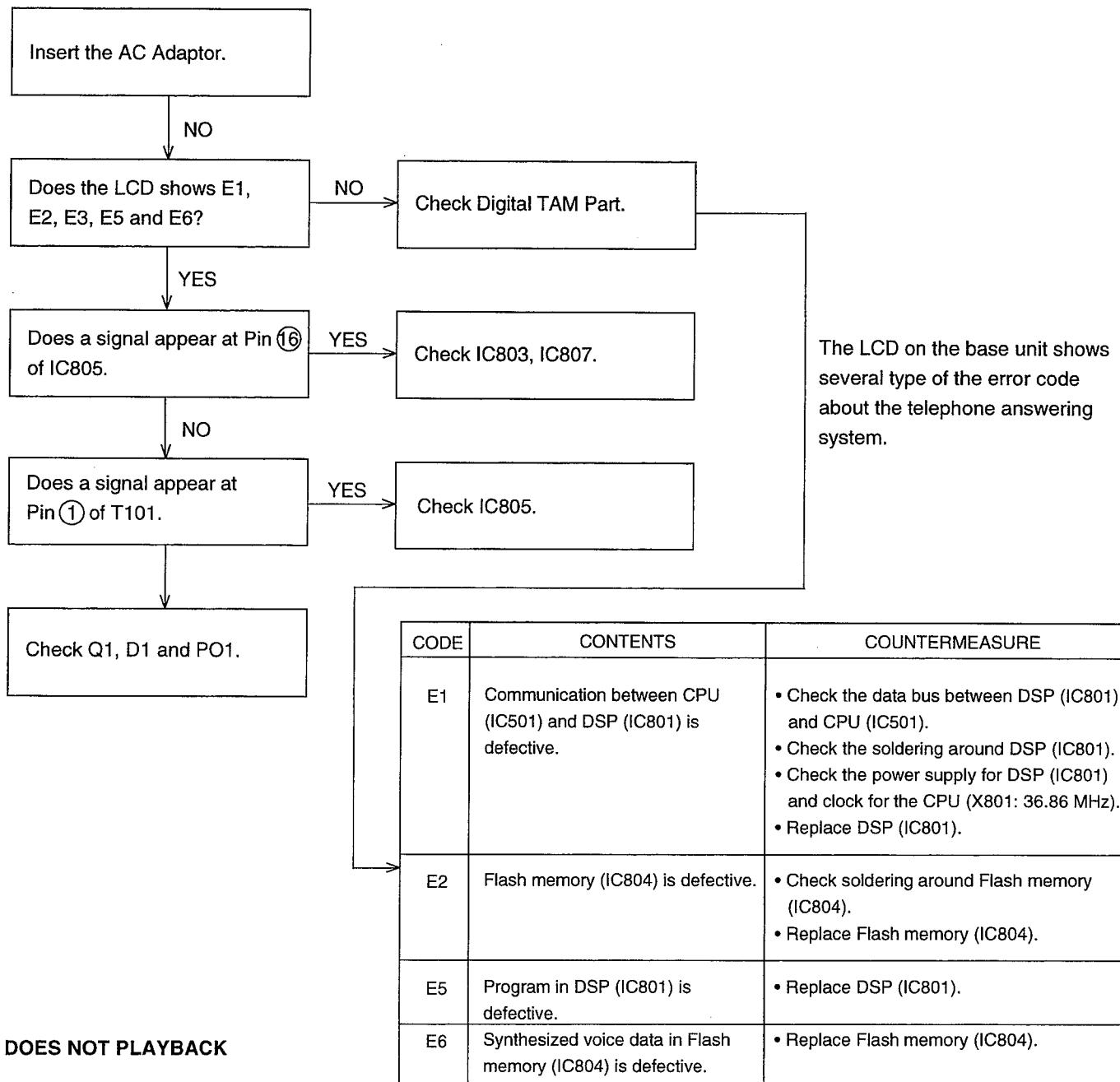
## (TAM SECTION)

## 1) NO POWER/DEAD

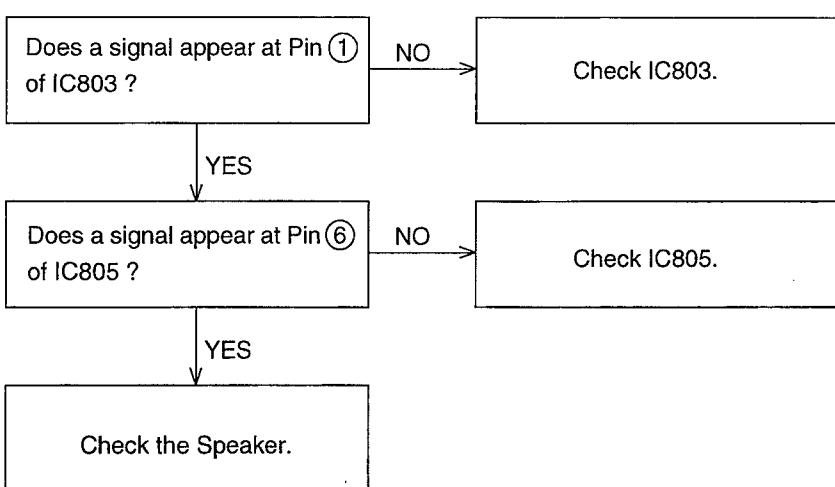


## KX-TCM416SAB

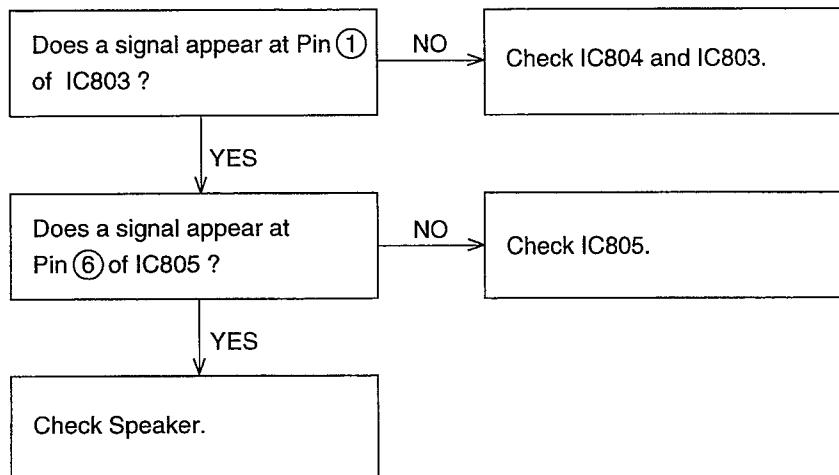
### 2) DOES NOT RECORD



### 3) DOES NOT PLAYBACK



## 4) THE SYNTHESIZED VOICE WILL NOT PLAYBACK



## 5) END OF MESSAGE IS CLIPPED WHEN CALLER HANGS UP.

When caller hangs up, the KX-TCM416SAB can detect the following 4 signal types.

- A. CPC pulse.
- B. Dial tone or other continuous tones.
- C. Silence.
- D. Cycle signals.

A. Check CPC DETECTOR CIRCUIT (D4, R8, C9, R501 and PC4)

B.,C.,D

Check VOX DETECTOR CIRCUIT (IC805, R843, R841, C841 and C846)

**KX-TCM416SAB**

**MEMO**

# TROUBLESHOOTING GUIDE (HANDSET)

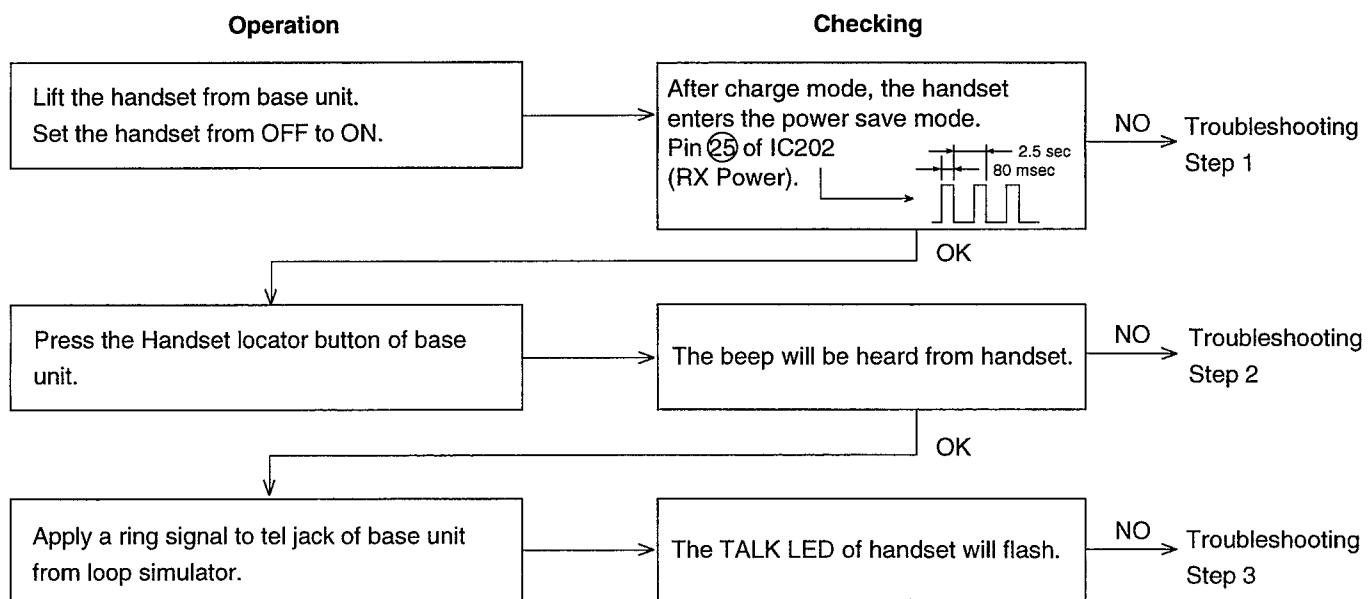
Use the right base unit for this troubleshooting.

Charge the battery of the handset by the base unit.

## Base unit condition:

1. Connect the AC Adaptor (KX-A11BS1FL1) plug into DC IN jack and the other end into a power outlet (AC 230 V, 50Hz).
2. Connect the loop simulator (DC 48 V) to tel jack.

Check the handset as shown by following below flow chart.

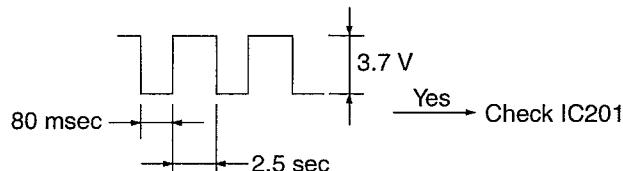


**Troubleshooting Step 1:** After stand-by mode, the handset does not enter the battery save mode.

### Check point

(1) Pin 25 of IC202

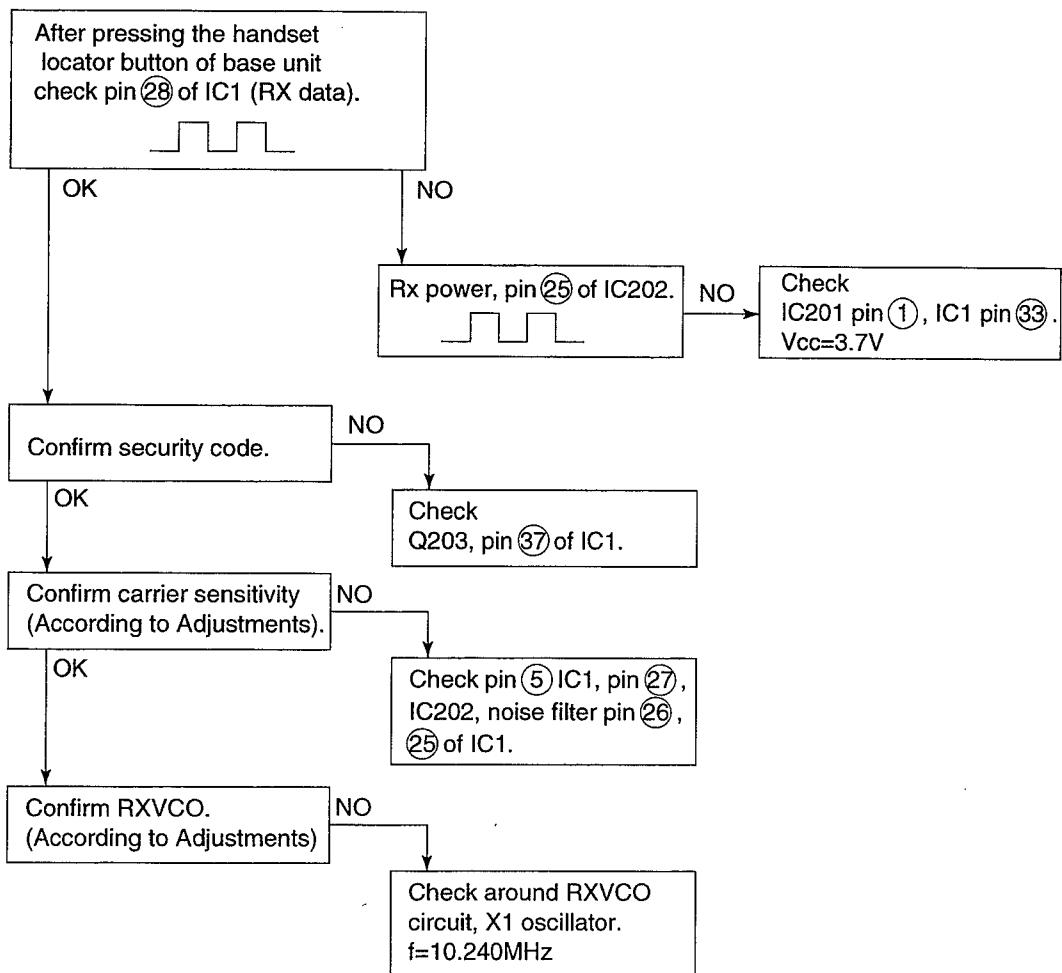
RX power output voltage



## KX-TCM416SAB

**Troubleshooting Step 2:** The Beep is not heard on the Handset.

### Check Points

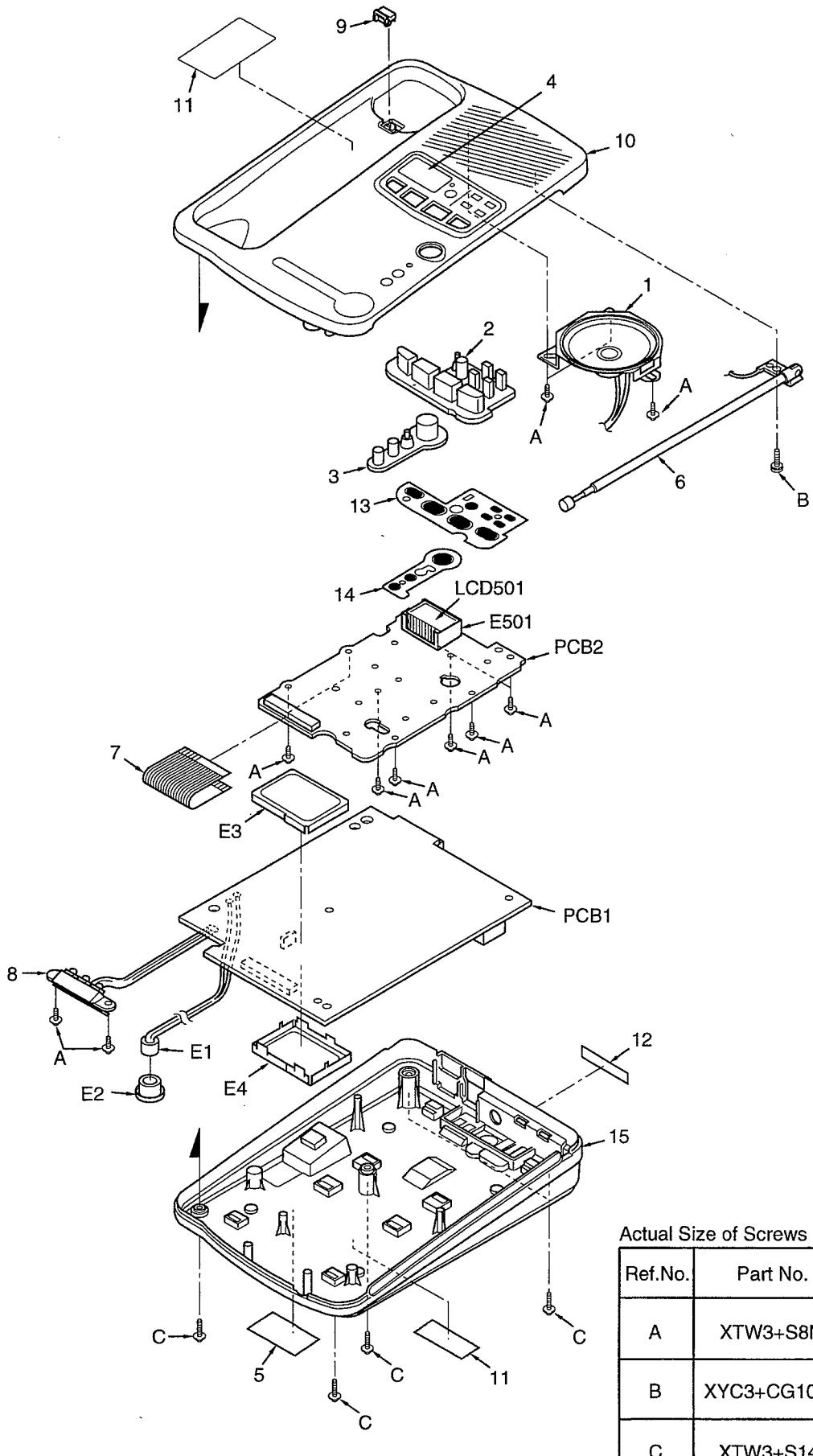


**Troubleshooting Step 3:** The TALK indicator does not flash (Check the data reception).

### Check Point

Check the signal level of receiver data circuit on page 53.

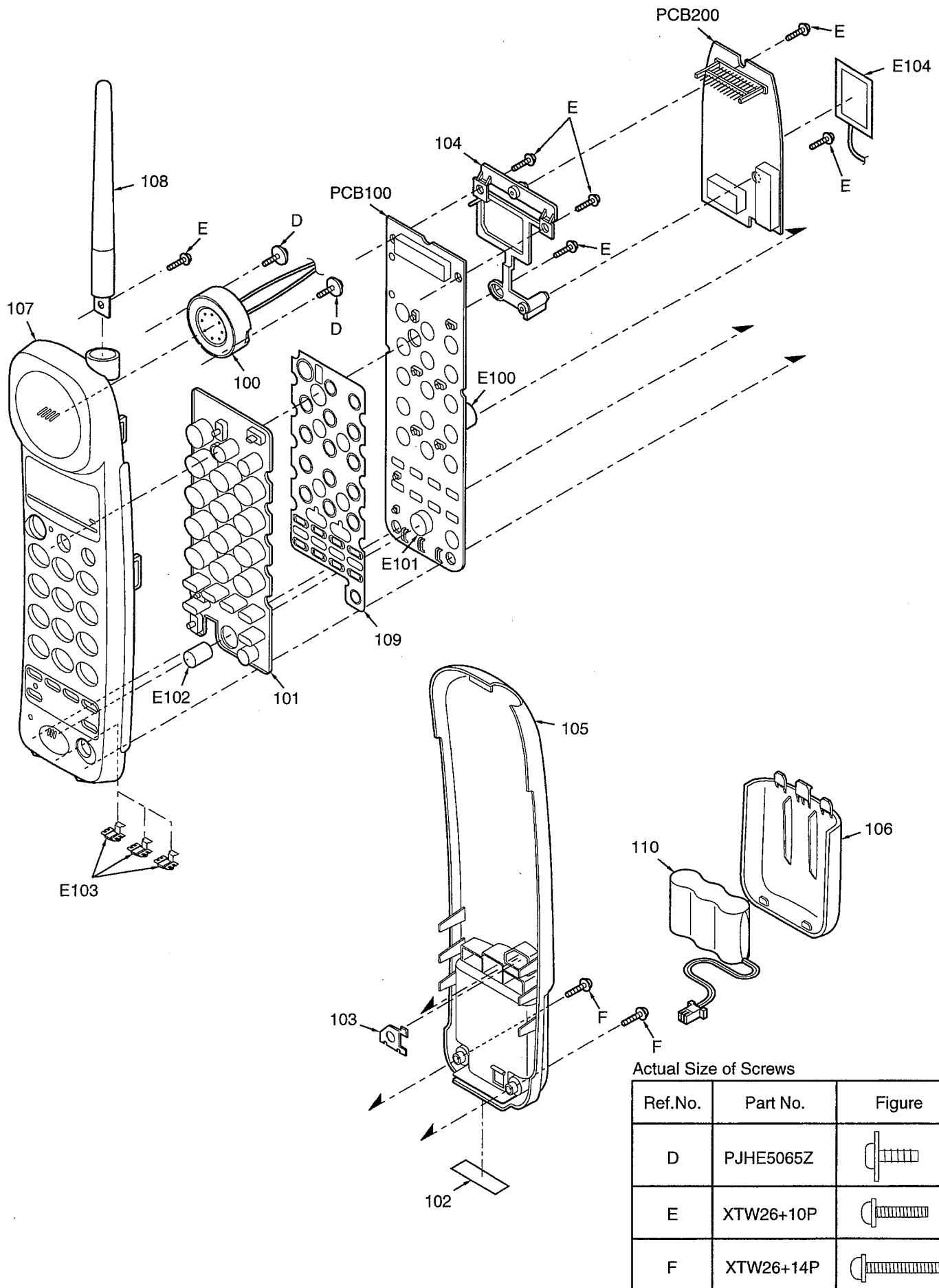
# CABINET AND ELECTRICAL PARTS LOCATION (BASE UNIT)



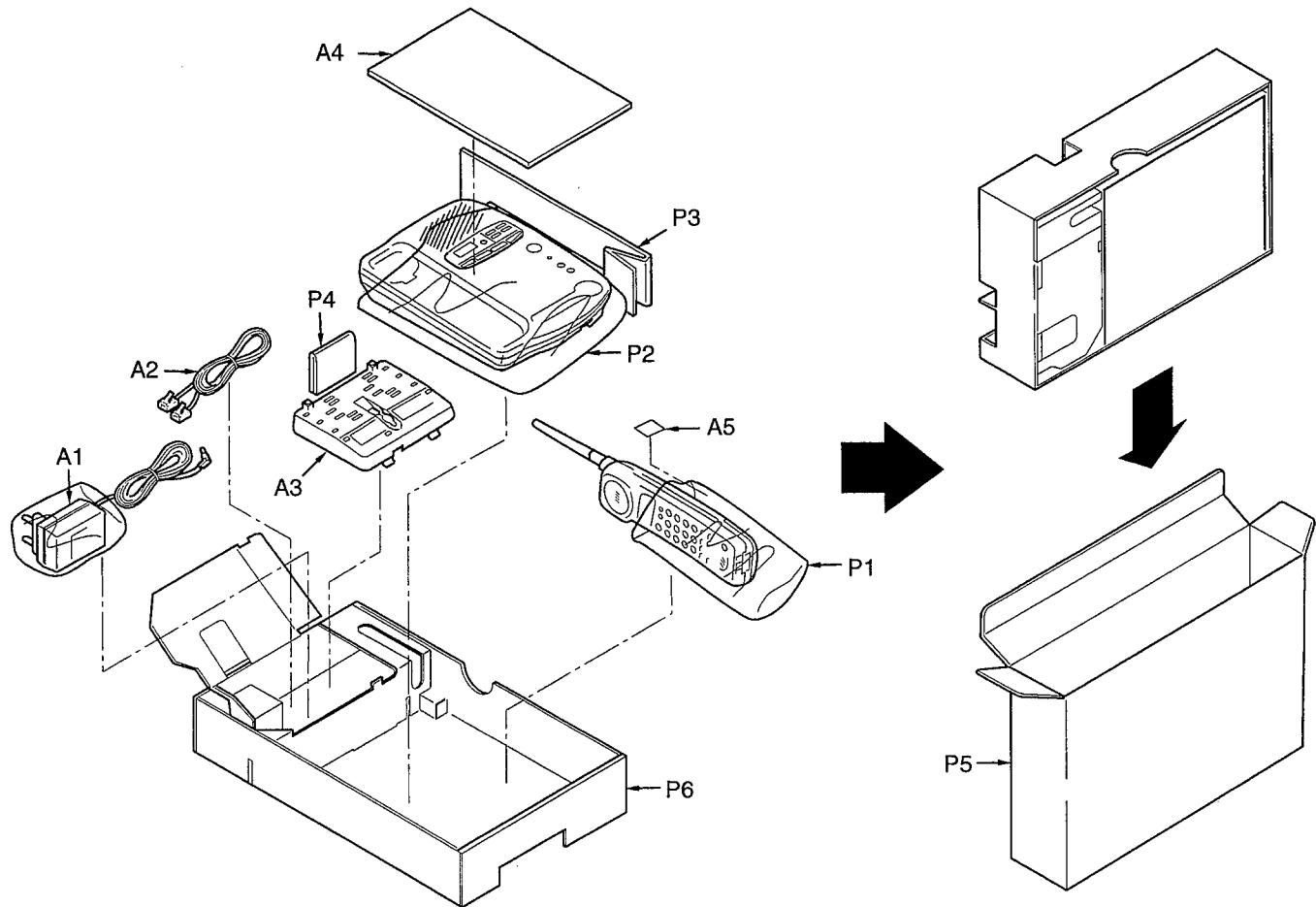
Actual Size of Screws

Ref.No.	Part No.	Figure
A	XTW3+S8M	
B	XYC3+CG10FX	
C	XTW3+S14P	

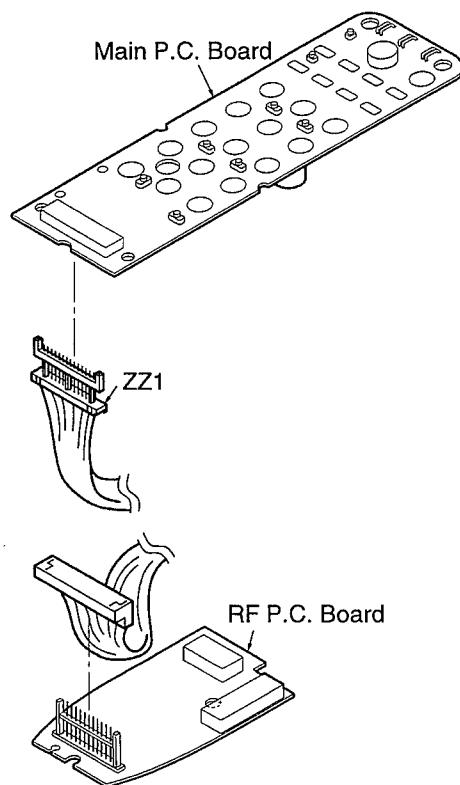
## CABINET AND ELECTRICAL PARTS LOCATION (HANDSET)



## ACCESSORIES AND PACKING MATERIALS



## EXTENSION CABLE CONNECTING METHOD



# KX-TCM416SAB

This replacement parts list is only for the model : KX-TCM416SAB.

## REPLACEMENT PARTS LIST

### Base Unit

#### Note:

#### 1. RTL (Retention Time Limited)

The marking (RTL) indicates that the Retention Time is limited for this item. After the discontinuation of this assembly in production, the item will continue to be available for a specific period of time. The retention period of availability is dependent on the type of assembly, and in accordance with the laws governing part and product retention.

After the end of this period, the assembly will no longer be available.

#### 2. Important safety notice.

Components identified by a  $\Delta$  mark special characteristics important for safety. When replacing any of these components, use only manufacturer's specified parts.

#### 3. The S mark indicates service standard parts and may differ from production parts.

#### 4. RESISTORS & CAPACITORS

Unless otherwise specified.

All resistors are in ohms ( $\Omega$ ) K=1000 $\Omega$ , M=1000K $\Omega$

All capacitors are in MICRO FARADS ( $\mu F$ ) P= $\mu F$

\*Type & Wattage of Resistor

Type

ERC:Solid	ERX:Metal Film	PQ4R:Carbon
ERD:Carbon	ERG:Metal Oxide	ERS:Fusible Resistor
PQRD:Carbon	ER0:Metal Film	ERF:Cement Resistor

Wattage

10,16:1/8W	14,25:1/4W	12:1/2W	1:1W	2:2W	3:3W
------------	------------	---------	------	------	------

\*Type & Voltage of Capacitor

Type

ECFD:semi-conductor	ECCD,ECKD,ECBT,PQCBC : Ceramic
ECQS:Styrol	ECQE,ECQV,ECQG : Polyester
PQCUV:Chip	ECEA,ECSZ : Electrolytic
ECQMS:Mica	ECQP : Polypropylene

Voltage

ECQ Type	ECQG ECQV Type	ECSZ Type	Others		
1H: 50V	05: 50V	0F:3.15V	0J :6.3V	1V :35V	
2A:100V	1:100V	1A:10V	1A :10V	50,1H:50V	
2E:250V	2:200V	1V:35V	1C :16V	1J :63V	
2H:500V		0J:6.3V	1E,25:25V	2A :100V	

Ref. No.	Part No.	Part Name & Description	Pcs/Set
CABINET & ELECTRICAL PARTS			

Ref. No.	Part No.	Part Name & Description	Pcs/Set
CABINET & ELECTRICAL PARTS			
1	PQAS65P36Y	SPEAKER	1
2	PQBX10285Z	BUTTON, TAM KEY	1
3	PQBX10286Z	BUTTON, VOLUME KEY	1
4	PQGP10134Z2	LCD PANEL	S 1
5	PQGT13460Y	NAME PLATE	1
6	XEAPQK170D	ANTENNA	1
7	PQJE10085Z	LEAD WIRE	1
8	PQJT10136Z	BATTERY TERMINAL	1
9	PQKE10066Z2	HANGER	S 1
10	PQKM10292P2	UPPER CABINET	1
11	PQQT11232Z	O/I LABEL	1
12	PQQT11748Z	ADAPTOR LABEL	1
13	PQSX10060Y	SHEET SWITCH	1
14	PQSX10061Z	SHEET SWITCH	1
15	PQYF10117N2	LOWER CABINET	S 1
MAIN P.C.BOARD PARTS			
PCB1	PQWP1M416SAH	P.C.BOARD AS'Y (RTL)	$\Delta$ 1
IC101	AN6183SAE1	(ICS)	S 1
IC201	PQVIT31224AH	IC	1
IC501	PQVI53MF5017	IC	1
IC801	PQVID6471A2	IC	S 1
IC803	PQVIMCL548DW	IC	1
IC804	PQWITCM422HM	IC	1
IC805	PQVISC111815	IC	1
IC806	PQVINJM4558M	IC	1
IC807	PQVIBU4053BF	IC	1
Q 1	2SA1625	(TRANSISTORS) TRANSISTOR(SI) (or 2SA1776P or 2SA1627)	1
Q 2	2SC1740S	TRANSISTOR(SI) (or 2SC3330)	1
Q 3	PQVTKSD261CY	TRANSISTOR(SI)	1
Q101	2SD1819A	TRANSISTOR(SI)	1
Q102	PQVTFB1A4M	TRANSISTOR(SI)	1
Q103	2SD1819A	TRANSISTOR(SI)	1
Q104	2SD1819A	TRANSISTOR(SI)	1
Q105	PQVTFB1A4M	TRANSISTOR(SI)	1
Q201	2SK543	TRANSISTOR(SI)	1
Q301	PQVTMSC2295C	TRANSISTOR(SI) (or 2SC2295)	1
Q302	2SC2412K	TRANSISTOR(SI)	1
Q401	2SD2137	TRANSISTOR(SI)	1
Q402	2SD1994A	TRANSISTOR(SI)	1
Q403	2SD1994A	TRANSISTOR(SI)	1
Q404	2SD1991A	TRANSISTOR(SI)	1
Q405	2SD1819A	TRANSISTOR(SI)	1
Q406	2SB709A	TRANSISTOR(SI)	1
Q407	2SD1819A	TRANSISTOR(SI)	1
Q408	2SD1991A	TRANSISTOR(SI)	1
Q409	2SD1991A	TRANSISTOR(SI)	1
Q410	2SD1991A	TRANSISTOR(SI)	1
Q411	2SD601A	TRANSISTOR(SI) (or 2SD601R)	1
Q501	PQVTTDA114YU	TRANSISTOR(SI)	1
Q503	PQVTTDA114YU	TRANSISTOR(SI)	1
Q801	2SD1819A	TRANSISTOR(SI)	1
Q802	2SB1218A	TRANSISTOR(SI) (or 2SA1603R)	1
Q803	2SD1819A	TRANSISTOR(SI)	1
Q804	PQVTFB1A4M	TRANSISTOR(SI)	1
Q911	2SA1625	TRANSISTOR(SI) (or 2SA1776P or 2SA1627)	1
Q921	2SA1625	TRANSISTOR(SI) (or 2SA1776P or 2SA1627)	1
Q931	UN5213	TRANSISTOR(SI)	1
Q932	UN5213	TRANSISTOR(SI)	1
Q959	2SB1218A	TRANSISTOR(SI) (or 2SA1603R)	1
D 1	PQVDS1ZB40F1	(DIODES)	1
D 3	MA700A	DIODE(SI)	1
D 4	MA4020	DIODE(SI)	1

This replacement parts list is only for the model : KX-TCM416SAB.

Ref. No.	Part No.	Part Name & Description	Pcs/Set	Ref. No.	Part No.	Part Name & Description	Pcs/Set
D201	MA110	DIODE(SI)	1	T301	PQL04A3	COIL	1
D202	MA110	DIODE(SI)	1	J401	PQLQZM100K	COIL	1
D301	PQVDKV1832C3	DIODE(SI)	1	X201	PQVCK1024LC5	(CRYSTAL OSCILLATORS)	1
D303	ISS119	DIODE(SI) (or 1SS133 or MA165)	1	X501	PQVCK7952N4Z	CRYSTAL OSCILLATOR	1
D401	MA4100	DIODE(SI) (or PQVDMZJ10BT)	1	X502	PQVCL3276N6Z	CRYSTAL OSCILLATOR	1
D402	MA4062	DIODE(SI) (or PQVDMZJ6R2)	1	X801	PQVCJ3686N4Z	CRYSTAL OSCILLATOR	1
D403	ISS119	DIODE(SI) (or 1SS133 or MA165)	1	DUP201	PQVFH25RX	(DUPLEXES)	1
D404	ISS119	DIODE(SI) (or 1SS133 or MA165)	1	DUP301	PQVFH25TX	DUPLEX	1
D405	MA4047	DIODE(SI)	1	DC JACK	PQJJ1B4Y	DUPLEX	1
D406	ISS119	DIODE(SI) (or 1SS133 or MA165)	1	TEL JACK	PQJJ1TA15Z	JACK, DC	1
D407	ISS119	DIODE(SI) (or 1SS133 or MA165)	1	PC1	ON3181	JACK, TEL	S
D412	ISS119	DIODE(SI) (or 1SS133 or MA165)	1	PC2	PQVITLP627	(PHOTO COUPLERS)	1
D413	MA110	DIODE(SI)	1	PC3	ON3131SKU	PHOTO COUPLER	▲ S
D414	MA110	DIODE(SI)	1	PC4	ON3131SKU	PHOTO COUPLER	1
D415	ISS119	DIODE(SI) (or 1SS133 or MA165)	1	PC911	PQVITLP627	PHOTO COUPLER	1
D416	MA4062	DIODE(SI) (or PQVDMZJ6R2)	1	PC921	ON3131SKU	PHOTO COUPLER	1
D417	MA700A	DIODE(SI)	1	RA801	EXRV8V222JV	(RESISTOR ARRAYS)	1
D510	MA110	DIODE(SI)	1	RA802	EXRV8V222JV	COMPONENTS PARTS, 2.2K	1
D521	ISS119	DIODE(SI) (or 1SS133 or MA165)	1	RA803	EXRV8V222JV	COMPONENTS PARTS, 2.2K	1
D522	ISS119	DIODE(SI) (or 1SS133 or MA165)	1	RA804	EXRV8V220JV	COMPONENTS PARTS, 22	1
D523	ISS119	DIODE(SI) (or 1SS133 or MA165)	1	RA805	EXRV8V472JV	COMPONENTS PARTS, 4.7K	1
D524	MA110	DIODE(SI)	1	RA806	EXRV8V472JV	COMPONENTS PARTS, 4.7K	1
D525	MA110	DIODE(SI)	1	RA807	EXRV8V472JV	COMPONENTS PARTS, 4.7K	1
D911	MA4220	DIODE(SI)	1	RA808	EXRV8V222JV	COMPONENTS PARTS, 2.2K	1
CA801	EXF1E4331KSL	(CAPACITOR ARRAYS)	1	RA809	EXRV8V221JV	COMPONENTS PARTS, 220	1
CA802	EXF1E4470KCV	COMPONENTS PARTS, 330P	1	RA810	EXRV8V221JV	COMPONENTS PARTS, 220	1
CA803	EXF1E4470KCV	COMPONENTS PARTS, 47P	1	L202	PQLQZK1R8K	(COILS AND TRANSFORMERS)	1
CA804	EXF1E4331KSL	COMPONENTS PARTS, 47P	1	L401	PQLQXF100K	COIL	1
CF201	PQVFSFE107MJ	(CERAMIC FILTERS)	1	L402	PQLQXF100K	COIL	1
CF202	PQVFCFH455F1	CERAMIC FILTER	1	L450	PQLQZM330K	COIL	1
		CERAMIC FILTER	1	L451	PQLQZM330K	COIL	1
			1	L452	PQLQZM330K	COIL	1
			1	L501	PQLQZM100K	COIL	1
			1	L502	PQLQZM100K	COIL	1
			1	L801	PQLQZM100K	COIL	1
			1	L806	PQLQZM100K	COIL	1
			1	L807	PQLQZM100K	COIL	1
T101	PQLT3E3A	I.F. TRANSFORMER	▲	SA1	PQVDDSS301L	(VARIABLE RESISTORS)	1
T102	PQLT3E3A	I.F. TRANSFORMER	▲	J2	PQVDDSP272MR	VARISTOR	1
T201	PQLA7A36	COIL	1	E1	PQJS30A19Z	VARISTOR	▲
T202	PQLI2B201	COIL	1	E2	PQJM122Z	MICROPHONE	1
T203	PQLA7A22	COIL	1	E3	PQMG10020Z	MIC SPACER	1
			1	E4	PQMC10252Z	SHIELD COVER	1
			1		PQMC10253Z	SHIELD COVER	1

## KX-TCM416SAB

This replacement parts list is only for the model : KX-TCM416SAB.

Ref. No.	Part No.	Value	Pcs/Set	Ref. No.	Part No.	Value	Pcs/Set
		(RESISTORS)					
R 1	ERDS2TJ473	47K	1	R222	ERJ3GEYJ683	68K	1
R 2	ERDS2TJ104	100K	1	R223	ERJ3GEYJ333	33K	1
R 3	ERDS2TJ472	4.7K	1	R224	ERJ3GEYJ683	68K	1
R 4	PQ4R10XJ393	39K	S 1	R225	ERJ3GEYJ333	33K	1
R 5	PQ4R10XJ183	18K	S 1	R226	ERJ3GEYJ106	10M	1
R 6	PQ4R10XJ562	5.6K	S 1	R227	ERJ3GEYJ106	10M	1
R 7	ERDS2TJ562	5.6K	1	R228	ERJ3GEYJ104	100K	1
R 8	ERDS2TJ270	27	1	R229	ERJ3GEYJ682	6.8K	1
R 9	ERDS2TJ331	330	1	R230	ERJ3GEYJ682	6.8K	1
R10	PQ4R10XJ103	10K	S 1	R231	ERJ3GEYJ103	10K	1
R11	PQ4R10XJ563	56K	S 1	R232	ERJ3GEYJ103	10K	1
R12	PQ4R10XJ392	3.9K	S 1	R233	ERJ3GEYJ395	3.9M	1
R14	PQ4R10XJ102	1K	S 1	R234	ERJ3GEYJ104	100K	1
R15	PQ4R10XJ682	6.8K	S 1	R235	ERJ3GEY0R00	0	1
R16	ERDS2TJ680	68	1	R237	ERJ3GEYJ103	10K	1
R17	ERDS1TJ330	33	S 1	R273	ERJ3GEYJ104	100K	1
R18	ERDS1TJ150	15	S 1	R275	ERJ3GEYJ182	1.8K	1
R19	PQ4R10XJ562	5.6K	S 1	R276	ERJ3GEYJ471	470	1
R63	PQ4R10XJ472	4.7K	S 1	R277	ERJ3GEYJ153	15K	1
R101	ERJ3GEYJ103	10K	1	R302	ERDS2TJ221	220	1
R102	ERJ3GEYJ334	330K	1	R303	ERJ3GEYJ102	1K	1
R103	PQ4R10XJ272	2.7K	S 1	R304	ERJ3GEYJ153	15K	1
R104	PQ4R10XJ561	560	S 1	R305	ERJ3GEYJ223	22K	1
R106	ERJ3GEYJ333	33K	1	R306	ERJ3GEYJ221	220	1
R107	ERJ3GEYJ563	56K	1	R307	ERJ3GEYJ102	1K	1
R109	ERJ3GEYJ223	22K	1	R308	PQ4R10XJ220	22	S 1
				R309	ERJ3GEYJ125	1.2M	1
R110	PQ4R10XJ683	68K	S 1	R310	ERJ3GEYJ220	22	1
R112	PQ4R10XJ101	100	S 1	R311	PQ4R10XJ103	10K	S 1
R113	PQ4R10XJ471	470	S 1	R312	ERJ3GEYJ153	15K	1
R114	PQ4R10XJ104	100K	S 1	R313	ERJ3GEYJ223	22K	1
R115	ERJ3GEYJ103	10K	1	R375	ERJ3GEYJ563	56K	1
R116	ERJ3GEYJ272	2.7K	1	R376	PQ4R10XJ473	47K	S 1
R117	ERJ3GEYJ684	680K	1				
R118	PQ4R10XJ820	82	S 1	R380	ERJ3GEY0R00	0	1
R119	PQ4R10XJ393	39K	S 1				
R120	PQ4R10XJ103	10K	S 1	R401	ERDS2TJ221	220	1
R121	ERJ3GEYJ184	180K	1	R403	PQ4R10XJ154	150K	S 1
R122	PQ4R10XJ473	47K	S 1	R404	ERDS2TJ221	220	1
R123	ERJ3GEYJ332	3.3K	1	R405	ERJ3GEYJ333	33K	1
R124	ERJ3GEY0R00	0	1	R406	ERJ3GEYJ224	220K	1
R128	ERJ3GEYJ154	150K	1	R407	ERJ3GEYJ154	150K	1
R129	PQ4R10XJ820	82	S 1	R408	ERJ3GEYJ104	100K	1
				R409	ERJ3GEYJ224	220K	1
R131	ERJ3GEYJ564	560K	1				
R202	PQ4R10XJ271	270	S 1	R410	ERJ3GEYJ104	100K	1
R204	PQ4R10XJ220	22	S 1	R411	ERJ3GEYJ104	100K	1
R205	ERJ3GEYJ331	330	1	R412	ERJ3GEYJ184	180K	1
R206	ERJ3GEYJ183	18K	1	R414	ERJ3GEYJ473	47K	1
R207	ERJ3GEYJ822	8.2K	1	R415	ERDS2TJ391	390	1
R208	ERJ3GEYJ182	1.8K	1	R418	ERDS2TJ221	220	1
R209	ERJ3GEYJ154	150K	1	R419	PQ4R10XJ103	10K	S 1
R210	ERJ3GEYJ154	150K	1	R421	ERJ3GEYJ104	100K	1
R211	ERJ3GEYJ562	5.6K	1	R422	ERDS1TJ470	47	1
R212	PQ4R10XJ153	15K	S 1	R502	ERJ3GEYJ106	10M	1
R213	ERJ3GEYJ104	100K	1	R503	ERJ3GEYJ472	4.7K	1
R214	PQ4R10XJ154	150K	S 1	R504	ERJ3GEYJ472	4.7K	1
R215	PQ4R10XJ183	18K	S 1	R505	ERJ3GEYJ472	4.7K	1
R216	PQ4R10XJ472	4.7K	S 1	R506	ERJ3GEYJ222	2.2K	1
R218	PQ4R10XJ273	27K	S 1	R507	ERJ3GEYJ272	2.7K	1
R219	PQ4R10XJ562	5.6K	S 1	R508	ERJ3GEYJ472	4.7K	1
				R509	ERJ3GEYJ392	3.9K	1
R220	ERJ3GEYJ333	33K	1				
R221	ERJ3GEYJ334	330K	1	R510	ERDS2TJ271	270	1

This replacement parts list is only for the model : KX-TCM416SAB.

Ref. No.	Part No.	Value	Pcs/Set	Ref. No.	Part No.	Value	Pcs/Set
R511	PQ4R10XJ333	33K	S 1	R852	ERJ3GEYJ103	10K	1
R512	ERJ3GEYJ333	33K	1	R853	ERJ3GEYF123	12K	1
R513	PQ4R10XJ563	56K	S 1	R854	ERJ3GEYJ334	330K	1
R514	ERJ3GEYJ392	3.9K	1	R855	ERJ3GEYJ823	82K	1
R515	ERJ3GEYJ223	22K	1	R856	ERJ3GEYJ473	47K	1
R516	ERJ3GEYJ105	1M	1	R860	PQ4R10XJ102	1K	S 1
R517	ERJ3GEYJ473	47K	1	R862	PQ4R10XJ563	56K	S 1
R518	ERJ3GEYJ104	100K	1	R864	PQ4R10XJ472	4.7K	S 1
R519	ERJ3GEYJ104	100K	1	R865	PQ4R10XJ124	120K	S 1
R520	ERJ3GEYJ104	100K	S 1	R866	PQ4R10XJ182	1.8K	S 1
R521	PQ4R10XJ104	100K	1	R867	PQ4R10XJ104	100K	S 1
R522	ERJ3GEYJ104	100K	1	R868	PQ4R10XJ104	100K	S 1
R523	ERJ3GEYJ104	100K	S 1	R869	ERJ3GEYJ473	47K	1
R524	PQ4R10XJ104	100K	1	R870	ERJ3GEYJ474	470K	1
R525	ERJ3GEYJ473	47K	1	R872	PQ4R10XJ223	22K	S 1
R526	PQ4R10XJ391	390	S 1	R873	PQ4R10XJ474	470K	S 1
R528	PQ4R10XJ471	470	S 1	R877	ERJ3GEYJ392	3.9K	1
R539	ERJ3GEYJ104	100K	1	R890	ERJ3GEYJ104	100K	1
R540	ERJ3GEYJ472	4.7K	1	R891	ERJ3GEYJ105	1M	1
R541	ERJ3GEYJ472	4.7K	1	R911	ERDS2TJ104	100K	1
R542	ERJ3GEYJ222	2.2K	1	R912	ERDS2TJ472	4.7K	1
R543	ERJ3GEYJ222	2.2K	1	R913	ERDS1TJ150	15	S 1
R545	ERJ3GEYJ472	4.7K	1	R914	ERJ3GEYJ472	4.7K	1
R546	ERJ3GEYJ472	4.7K	1	R921	PQ4R10XJ123	12K	S 1
R547	ERJ3GEYJ472	4.7K	1	R922	ERDS1TJ120	12	S 1
R548	ERJ3GEYJ472	4.7K	1	R923	PQ4R10XJ102	1K	S 1
R549	ERJ3GEYJ472	4.7K	1	R924	ERDS2TJ822	8.2K	1
R550	ERJ3GEYJ472	4.7K	1	R925	ERDS2TJ152	1.5K	1
R551	ERJ3GEYJ472	4.7K	1	R931	ERJ3GEYJ103	10K	1
R552	ERJ3GEYJ472	4.7K	1	R932	ERJ3GEYJ683	68K	1
R553	ERJ3GEYJ103	10K	1	R933	ERJ3GEYJ103	10K	1
R554	ERJ3GEYJ472	4.7K	1	R962	PQ4R10XJ104	100K	S 1
R555	ERJ3GEYJ472	4.7K	1	R963	PQ4R10XJ103	10K	S 1
R557	ERJ3GEYJ102	1K	1	R964	PQ4R10XJ103	10K	S 1
R558	ERJ3GEYJ102	1K	1	R968	PQ4R10XJ103	10K	S 1
R813	ERJ3GEYJ105	1M	1	R969	PQ4R10XJ103	10K	S 1
R814	ERJ3GEYJ681	680	1	VR101	ERDS2TJ153	15K	1
R815	ERJ3GEYJ221	220	1	J203	ERJ3GEY0R00	0	1
R816	ERJ3GEYJ221	220	1	J301	ERJ3GEY0R00	0	1
R822	ERJ3GEYJ220	22	1	J302	ERJ3GEY0R00	0	1
R824	ERJ3GEYJ103	10K	1	J501	ERJ3GEY0R00	0	1
R829	ERJ3GEY0R00	0	1	C118	PQ4R10XJ000	0	1
R830	ERJ3GEY0R00	0	1	C201	ERJ3GEY0R00	0	1
R831	ERJ3GEYJ103	10K	1	C316	ERJ3GEY0R00	0	1
R833	ERJ3GEYJ103	10K	1	C509	ERJ3GEY0R00	0	1
R834	ERJ3GEYJ473	47K	1				
R835	ERJ3GEYJ473	47K	1				
R836	ERJ3GEYJ123	12K	1				
R837	ERJ3GEYJ473	47K	1				
R838	ERJ3GEYJ223	22K	1				
R839	ERJ3GEYJ103	10K	1				
R840	ERJ3GEY0R00	0	1				
R841	ERJ3GEYJ682	6.8K	1				
R842	PQ4R10XJ103	10K	S S 1				
R843	PQ4R10XJ123	12K	1				
R844	ERJ3GEYF152	1.5K	1				
R845	ERJ3GEYJ683	68K	1				
R846	ERJ3GEYJ223	22K	1				
R847	ERJ3GEYF222	2.2K	1				
R848	ERJ3GEYJ223	22K	1				
R850	ERJ3GEYJ473	47K	1				
R851	ERJ3GEYJ104	100K	1				

# KX-TCM416SAB

This replacement parts list is only for the model : KX-TCM416SAB.

Ref. No.	Part No.	Value	Pcs/Set	Ref. No.	Part No.	Value	Pcs/Set
C 1	ECQE2E474KZ	(CAPACITORS)		C230	ECEA1HKS010	1	S 1
C 4	ECKD2H681KB	0.47	S 1	C231	ECUV1C104KBV	0.1	1
C 5	ECKD2H681KB	680P	S 1	C232	ECUV1H332KBV	0.0033	1
C 6	ECEA1CKA221	680P	S 1	C233	ECUV1H221JCV	220P	1
C 7	ECUV1H103KB	220	1	C234	ECUV1H681JCV	680P	S 1
C 8	ECEA1HKS2R2	0.01	1	C235	PQCUV1E104MD	0.1	S 1
C 9	PQCUV1E104MD	2.2	S 1	C236	PQCUV1H102J	0.001	S 1
C10	PQCUV1E333MD	0.1	S 1	C237	ECUV1H560GCV	56P	1
C11	ECEA1CKS100	0.033	S 1	C238	ECUV1H470GCV	47P	1
C12	PQCUV1H101JC	10	S 1	C239	ECUV1H560GCV	56P	1
C13	PQCUV1H103KB	100P	1	C241	PQCUV1C105ZF	1	1
C14	PQCUV1H103KB	0.01	1	C242	PQCUV1E104MD	0.1	S 1
C15	ECEA1CKS100	0.01	S 1	C243	ECEA1EU4R7	4.7	1
C16	ECEA1HKS3R3	10	S 1	C245	ECEA1HKS010	1	S 1
C17	ECEA1CKS220	3.3	S 1	C246	PQCUV1H153KB	0.015	1
C18	ECEA1HKS010	22	S 1	C247	PQCUV1C224KB	0.22	1
C50	ECKDNB471MB	1	S 1	C248	ECUV1H470JCV	47P	1
C101	PQCUV1H102J	470P	A 1	C249	PQCUV1H103KB	0.01	1
C103	ECUV1H271JCV	0.001	S 1	C250	ECEA1CKS100	10	S 1
C104	PQCUV1H222KB	270P	1	C251	PQCUV1E104MD	0.1	S 1
C105	PQCUV1E104MD	0.0022	S 1	C253	ECUV1H101GCV	100P	1
C107	PQCUV1E104MD	0.1	S 1	C254	PQCUV1H102J	0.001	S 1
C110	ECEA1CKS100	0.1	S 1	C255	PQCUV1E104MD	0.1	S 1
C111	PQCUV1E104MD	10	S 1	C273	ECUV1C104ZFV	0.1	1
C112	ECUV1H101JCV	0.1	S 1	C275	ECUV1H121GCV	120P	1
C113	PQCUV1E104MD	100P	1	C279	ECUV1H560JCV	56P	1
C114	PQCUV1E104MD	0.1	S 1	C280	ECUV1C104KBV	0.1	1
C115	ECUV1C104KBV	0.1	S 1	C281	ECUV1H472KBV	0.0047	1
C116	PQCUV1C105ZF	1	S 1	C301	PQCUV1H103ZF	0.01	1
C117	PQCUV1E104MD	0.1	S 1	C302	PQCUV1H220JCV	22P	1
C122	PQCUV1H392KB	0.0039	S 1	C303	ECUV1H270JCV	27P	1
C123	PQCUV1H151JC	150P	1	C304	ECUV1H103KBV	0.01	S 1
C124	PQCUV1H103KB	0.01	S 1	C305	ECUV1H470JCV	47P	1
C125	ECUV1H392KBV	0.0039	S 1	C306	ECUV1H470JCV	47P	1
C126	PQCUV1E104MD	0.0022	S 1	C307	ECUV1H470JCV	47P	1
C128	ECA1AM102	0.1	S 1	C308	ECEA1HKS010	1	S 1
C203	ECUV1C104ZFV	0.001	S 1	C309	ECUV1H120JUV	12P	1
C204	PQCUV1H103KB	0.01	S 1	C310	ECUV1H680JCV	68P	1
C205	PQCUV1H103KB	0.01	S 1	C311	ECUV1H681JCV	680P	S 1
C206	ECUV1H102KBV	0.001	S 1	C312	PQCUV1E104MD	0.1	S 1
C207	ECEA1CKS100	10	S 1	C313	ECUV1C104KBV	0.1	1
C208	PQCUV1E104MD	0.1	S 1	C314	ECUV1H220JCV	22P	1
C209	ECEA1HKS2R2	2.2	S 1	C315	PQCUV1H103ZF	0.01	1
C210	ECUV1H102KBV	0.001	S 1	C374	ECUV1C104KBV	0.1	1
C211	PQCUV1E104MD	0.1	S 1	C402	PQCUV1E104MD	0.1	S 1
C212	PQCUV1E104MD	0.1	S 1	C403	ECEA1CU471	470	1
C213	PQCUV1E104MD	0.1	S 1	C404	ECEA1CU331	330	1
C214	ECUV1H270JCV	27P	S 1	C406	ECEA1AU331	330	1
C215	ECUV1C104ZFV	0.1	S 1	C408	PQCUV1C224KB	0.22	1
C216	ECEA1EK470	47	S 1	C410	PQCUV1H103KB	0.01	1
C217	ECUV1H472KBV	0.0047	S 1	C411	PQCUV1E104MD	0.1	S 1
C218	ECUV1H221JCV	220P	S 1	C412	ECEA0JU331	330	1
C219	ECUV1H221JCV	220P	S 1	C413	ECEA0JSJ331	330	S 1
C220	PQCUV1C683KB	0.068	S 1	C414	PQCUV1E104MD	0.1	S 1
C221	PQCUV1E473MD	0.047	S 1	C415	ECUV1E105ZF	1	1
C222	PQCUV1H103KB	0.01	S 1	C501	ECUV1H220JCV	22P	1
C223	PQCUV1H331JC	330P	S 1	C502	ECUV1H220JCV	22P	1
C226	PQCUV1H182KB	1800P	S 1	C503	ECUV1C104ZFV	0.1	1
C227	PQCUV1E104MD	0.1	S 1	C504	ECUV1H180JCV	18P	1
C228	ECUV1H222KBV	0.0022	S 1	C505	ECUV1H180JCV	18P	1
C229	ECUV1H680JCV	68P	S 1				

This replacement parts list is only for the model : KX-TCM416SAB.

Ref. No.	Part No.	Value	Pcs/Set
C510	EECW5R5D473	0.047	S 1
C511	ECUV1C104ZFV	0.1	S 1
C513	ECEA0JU102	1000	S 1
C514	ECUV1C104ZFV	0.1	S 1
C515	ECUV1C104ZFV	0.1	S 1
C517	ECUV1C104ZFV	0.1	S 1
C542	ECUV1C104KBV	0.1	S 1
C543	ECUV1C104KBV	0.1	S 1
C546	ECUV1C104ZFV	0.1	S 1
C813	ECUV1H120JCV	12P	S 1
C814	ECUV1H120JCV	12P	S 1
C815	ECUV1H681JCV	680P	S 1
C816	ECUV1H681JCV	680P	S 1
C817	PQCUV1E104MD	0.1	S 1
C818	PQCUV1C105ZF	1	S 1
C822	ECEA1CK101	100	S 1
C823	ECUV1H101JCV	100P	S 1
C824	ECUV1C104ZFV	0.1	S 1
C825	ECUV1C104ZFV	0.1	S 1
C829	ECUV1C104ZFV	0.1	S 1
C832	PQCUV1C105ZF	1	S 1
C833	ECUV1C104KBV	0.1	S 1
C834	ECUV1C104ZFV	0.1	S 1
C835	ECUV1C104KBV	0.1	S 1
C836	PQCUV1C105ZF	1	S 1
C837	ECUV1C473KBV	0.047	S 1
C838	PQCUV1E104MD	0.1	S 1
C839	PQCUV1C105ZF	1	S 1
C840	PQCUV1E473MD	0.047	S 1
C841	PQCUV1H123MD	0.012	S 1
C842	ECUV1H103KBV	0.01	S 1
C843	ECUV1C104ZFV	0.1	S 1
C845	PQCUV1E104MD	0.1	S 1
C846	PQCUV1C683KB	0.068	S 1
C847	ECUV1H332KBV	0.0033	S 1
C848	ECUV1H332KBV	0.0033	S 1
C849	ECUV1H682KBV	0.0068	S 1
C850	PQCUV1H223KB	0.022	S 1
C851	ECUV1C104ZFV	0.1	S 1
C852	ECEA1CKS220	22	S 1
C853	ECEA0JU102	1000	S 1
C854	ECEA1CKS470	47	S 1
C855	ECUV1H223KBV	0.022	S 1
C856	PQCUV1H471JC	470P	S 1
C857	ECUV1H102KBV	0.001	S 1
C858	ECEA0JKS101	100	S 1
C860	PQCUV1E333MD	0.033	S 1
C863	PQCUV1H821JC	820P	S 1
C864	PQCUV1H332KB	3300P	S 1
C865	PQCUV1E333MD	0.033	S 1
C866	PQCUV1E104MD	0.1	S 1
C867	ECEA1AKS101	100	S 1
C868	PQCUV1E104MD	0.1	S 1
C870	PQCUV1C683KB	0.068	S 1
C871	PQCUV1E104MD	0.1	S 1
C879	PQCUV1E104MD	0.1	S 1
C881	ECUV1C104KBV	0.1	S 1
C890	ECUV1C104KBV	0.1	S 1
C921	ECEA1CKS100	10	S 1
C931	ECEA1CKS100	10	S 1

Ref. No.	Part No.	Part Name & Description	Pcs/Set
C932	ECUV1H223KBV	0.022	S 1
C933	ECUV1C104KBV	0.1	S 1
D409	ECEA1HKS2R2	2.2	S 1
OPERATIONAL P.C. BOARD PARTS			
PCB2	PQWP2M416SAH	P.C. BOARD ASS'Y (RTL)	1
LED551	LNJ301MPUJA	(DIODES)	1
LED553	PQVDSLN210VC	DIODE(SI) DIODE(SI)	1
CN502	PQJS30A19Z	(CONNECTOR) CONNECTOR	1
LCD501	PQADHLC7124	(OTHERS)	1
E105	PQHR10552Z	LIQUID CRYSTAL DISPLAY LCD HOLDER	1

# KX-TCM416SAB

This replacement parts list is only for the model : KX-TCM416SAB.

## REPLACEMENT PARTS LIST

### Handset

#### 1. RTL (Retention Time Limited)

Note: The marking (RTL) indicates that the Retention Time is limited for this item. After the discontinuation of this assembly in production, the item will continue to be available for a specific period of time. The retention period of availability depends on the type of assembly and the laws governing parts and product retention. At the end of this period, the assembly will no longer be available.

#### 2. Important safety notice

Components identified by the  $\Delta$  mark indicates special characteristics important for safety. When replacing any of these components, only use specified manufacturer's parts.

#### 3. The S mark indicates service standard parts and may differ from production parts.

#### 4. RESISTORS & CAPACITORS

Unless otherwise specified;

All resistors are in ohms ( $\Omega$ ) K=1000 $\Omega$ , M=1000K $\Omega$

All capacitors are in MICRO FARADS ( $\mu F$ ) P= $\mu\mu F$

\*Type & Wattage of Resistor

Type

ERC:Solid	ERX:Metal Film	PQ4R:Carbon
ERD:Carbon	ERG:Metal Oxide	ERS:Fusible Resistor
PQRD:Carbon	ER0:Metal Film	ERF:Cement Resistor

Wattage

10,16:1/8W	14,25:1/4W	12:1/2W	1:1W	2:2W	3:3W
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\*Type & Voltage of Capacitor

Type

ECFD:Semi-Conductor	ECCD,ECKD,ECBT,PQCBC : Ceramic
ECQS:Styrol	ECQE,ECQV,ECQG : Polyester
PQCUV:Chip	ECEA,ECSZ : Electrolytic
ECQMS:Mica	ECQP : Polypropylene

Voltage

ECQ Type	ECQG ECQV Type	ECSZ Type	Others		
1H: 50V	05: 50V	0F:3.15V	0J :6.3V	1V :35V	
2A:100V	1:100V	1A:10V	1A :10V	50,1H:50V	
2E:250V	2:200V	1V:35V	1C :16V	1J :63V	
2H:500V		0J:6.3V	1E,25:25V	2A :100V	

Ref. No.	Part No.	Part Name & Description	Pcs/Set
CABINET & ELECTRICAL PARTS			
100	PQAX3P16Z	SPEAKER	1
101	PQBX10317U	BUTTON, KEY	1
102	PQGT13461Z	NAME PLATE	1
103	PQHG10479Z	SPACER	1
104	PQHR10559Z	RF HOLDER	1
105	PQKF10212X2	LOWER CABINET	S 1
106	PQKK10081Z2	BATTERY COVER	S 1
107	PQKM10289A4	UPPER CABINET	1
108	PQSA10065Y	ANTENNA	1
109	PQSX10057Z	SHEET SWITCH	1
110	PQXA36ASVC	BATTERY	1
(COILS)			
L201	PQLQZMR68M	COIL	S 1
L202	PQLQZM100K	COIL	1
L203	PQLQZM220K	COIL	1
L204	PQLQZM1R0K	COIL	1
L205	ELJFAR68M	COIL	1
(CONNECTORS)			
CN1	PQJP12B55Z	CONNECTOR	1
CN101	PQJP2D13Z	CONNECTOR	1
CN201	PQJS12A36Z	CONNECTOR	1
(CRYSTALS)			
X1	PQVCK1024LC5	CRYSTAL OSCILLATOR	1
X201	PQVCJ3992N9Z	CRYSTAL OSCILLATOR	1
X202	PQVCL3276N9Z	CRYSTAL OSCILLATOR	1

This replacement parts list is only for the model : KX-TCM416SAB.

Ref. No.	Part No.	Part Name, Description, & Value	Pcs/Set	Ref. No.	Part No.	Value	Pcs/Set
E100	PQEFPBDB111GP	(OTHERS)		J207	PQ4R10XJ000	0	1
E101	PQJM122Z	BUZZER	1	JQ2	PQ4R10XJ000	0	1
E102	PQHE10070Z	MICROPHONE	1				
E103	PQJT10137Z	MIC SPOGE	1				
E104	PQMC10265Z	BATTERY TERMINAL	3				
		SHIELD COVER	1				
R22	PQ4R10XJ683	(RESISTORS)		C203	ECEA0GKS221	(CAPACITORS)	
R27	PQ4R10XJ183	68K	S 1	C205	PQCUV1C105ZF	220	1
R28	PQ4R10XJ475	18K	S 1	C208	PQCUV1H103ZF	1	1
		4.7M	S 1	C209	PQCUV1C105ZF	0.01	1
R201	PQ4R10XJ104	100K	S 1	C210	PQCUV1C105ZF	1	1
R202	PQ4R10XJ334	330K	S 1	C211	PQCUV1H103ZF	0.01	1
R203	PQ4R10XJ334	330K	S 1	C212	PQCUV1E104MD	0.1	
R204	PQ4R10XJ331	330	S 1	C214	PQCUV1H470JC	47P	S 1
R205	PQ4R10XJ103	10K	S 1	C215	PQCUV1H470JC	47P	1
R206	PQ4R10XJ472	4.7K	S 1	C216	PQCUV1H270JC	27P	1
R208	PQ4R10XJ104	100K	S 1	C217	PQCUV1H270JC	27P	1
R209	PQ4R10XJ331	330	S 1	C218	PQCUV1H103ZF	0.01	1
R211	PQ4R10XJ472	4.7K	S 1	C219	PQCUV1H103ZF	0.01	1
R212	PQ4R10XJ472	4.7K	S 1				
R213	PQ4R10XJ473	47K	S 1	C220	PQCUV1E104MD	0.1	S 1
R215	PQ4R10XJ104	100K	S 1	C221	PQCUV1E104MD	0.1	S 1
R217	PQ4R10XJ333	33K	S 1	C222	PQCUV1C105ZF	1	1
R219	PQ4R10XJ104	100K	S 1	C223	PQCUV1E104MD	0.1	S 1
R220	PQ4R10XJ473	47K	S 1	C225	PQCUV1H821JC	820P	S 1
R221	PQ4R10XJ122	1.2K	S 1				
R222	PQ4R10XJ222	2.2K	S 1				
R223	PQ4R10XJ103	10K	S 1				
R224	PQ4R10XJ332	3.3K	S 1				
R225	PQ4R10XJ104	100K	S 1				
R226	PQ4R10XJ104	100K	S 1				
R228	PQ4R10XJ681	680	S 1				
R229	PQ4R18XJ681	680	S 1				
R230	PQ4R10XJ681	680	S 1				
R231	PQ4R10XJ681	680	S 1				
R232	PQ4R10XJ221	220	S 1				
R234	PQ4R10XJ332	3.3K	S 1				
R238	PQ4R10XJ103	10K	S 1				
R240	PQ4R10XJ120	12	S 1				
R241	PQ4R18XJ102	1K	S 1				
R245	PQ4R10XJ331	330	S 1				
R246	PQ4R10XJ331	330	S 1				
R251	PQ4R10XJ270	27	S 1				
R252	PQ4R10XJ223	22K	S 1				

## KX-TCM416SAB

This replacement parts list is only for the model : KX-TCM416SAB.

Ref. No.	Part No.	Part Name & Description	Pcs/Set	Ref. No.	Part No.	Value	Pcs/Set
RF UNIT PARTS							
PCB200	PQWP2M416SAR	P.C.BOARD ASS'Y (RTL)	1	R 1	ERJ3GEYJ680	(RESISTORS)	
IC1	PQVIT31224AR	(IC) IC	1	R 2	ERJ3GEYJ331	68	1
Q101	2SC2295	(TRANSISTORS)		R 3	ERJ3GEYJ183	330	1
Q103	PQVTMSC2295C	TRANSISTOR(SI)	S	R 4	ERJ3GEYJ183	18K	1
		TRANSISTOR(SI)	1	R 5	ERJ3GEYJ154	18K	1
D101	MA840BTAKU	(DIODES)		R 6	ERJ3GEYJ154	150K	1
D102	MA840ATAKU	DIODE(SI)	1	R 7	ERJ3GEYJ681	680	1
		DIODE(SI)	1	R 8	ERJ3GEYJ562	150K	1
L1	PQLQZMR47K	(COIL AND TRANSFORMERS)		R 9	ERJ3GEYJ562	5.6K	1
L4	PQLI2B201	COIL	1	R 10	ERJ3GEYJ153	15K	1
L5	PQL04A2	COIL	1	R 11	ERJ3GEYJ822	150K	1
L105	PQLA7A22	COIL	1	R 12	ERJ3GEYJ822	8.2K	1
CF1	PQVFSFE107MJ	(CERAMIC FILTERS)		R 13	ERJ3GEYJ0R00	8.2K	1
CF2	PQVFCH455F1	CERAMIC FILTER	S	R 14	ERJ3GEYJ333	0	1
		CERAMIC FILTER	1	R 15	ERJ3GEYJ272	33K	1
DUP1	PQVFR25RX	(DUPLEXES)		R 16	ERJ3GEYJ473	2.7K	1
DUP101	PQVFR25TX	DUPLEX	1	R 18	ERJ3GEYJ223	47K	1
		DUPLEX	1	R 19	ERJ3GEYJ124	22K	1
VR1	EVNDXAA03B54	(VARIABLE RESISTORS)		R 20	ERJ3GEYJ124	120K	1
VR101	EVNDXAA03B55	VARIABLE RESISTOR	1	R 23	ERJ3GEYJ184	180K	1
		VARIABLE RESISTOR	1	R 24	ERJ3GEYJ153	15K	1
				R 33	ERJ3GEYJ124	150K	1
				R 34	ERJ3GEYJ332	3.3K	1
				R 35	ERJ3GEYJ224	220K	1
				R 36	ERJ3GEYJ103	10K	1
				R 37	ERJ3GEYJ104	100K	1
				R 38	ERJ3GEYJ153	15K	1
				R 39	ERJ3GEYJ182	1.8K	1
				R 40	ERJ3GEYJ222	1.8K	1
				R 101	ERJ3GEYJ561	2.2K	1
				R 102	ERJ3GEYJ220	560	1
				R 103	ERJ3GEYJ220	22	1
				R 104	ERJ3GEYJ223	22K	1
				R 108	ERJ3GEYJ273	22K	1
				R 109	ERJ3GEYJ472	27K	1
				R 110	ERJ3GEYJ822	4.7K	1
				R 112	ERJ3GEYJ823	8.2K	1
				R 113	ERJ3GEYJ470	82K	1
				R 116	ERJ3GEYJ823	47	1
				R 117	ERJ3GEYJ683	82K	1
				R 500	ERJ3GEYJ564	68K	1
				R 501	ERJ3GEYJ220	560K	1
				C 1	ERJ3GEYJ393	22	1
				C 37	ERJ3GEYJ220	39K	1
				C 102	ERJ3GEYJ0R00	0	1
						0	1
						0	1
						0	1

This replacement parts list is only for the model : KX-TCM416SAB.

Ref. No.	Part No.	Value	Pcs/Set	Ref. No.	Part No.	Value	Pcs/Set
C 3	ECST1EY474	(CAPACITORS) 0.47	1	C119	ECUV1C104ZFV	0.1	1
C 4	ECUV1H102KBV	0.001	1	C120	ECUV1C104ZFV	0.1	1
C 5	PQCUV1E104MD	0.1	S 1	C501	ECUV1H103KBV	0.01	S 1
C 6	ECEA0JKS470	47	1	R115	ECUV1H103KBV	0.01	S 1
C 7	ECUV1C104ZFV	0.1	1				
C 8	ECUV1H270JCV	27P	S 1				
C 9	ECUV1H221JCV	220P	1				
C10	ECUV1H472KBV	0.0047	1				
C11	ECUV1H221JCV	220P	1				
C12	PQCUV1C683KB	0.068	1				
C13	PQCUV1C105ZF	1	1				
C14	ECEA1CKS100	10	1				
C15	PQCUV1C224KB	0.22	1				
C16	ECUV1H103KBV	0.01	1				
C17	PQCUV1C224KB	0.22	1				
C18	ECUV1H153KBV	0.015	1				
C20	ECUV1H223KBV	0.022	S 1				
C21	ECUV1H220JCV	22P	1				
C22	ECUV1C104ZFV	0.1	1				
C23	ECUV1H102KBV	0.001	1				
C24	ECEA1CKS220	22	S 1				
C25	ECSTAJ1CA225	2.2	S 1				
C26	PQCUV1E104MD	0.1	S 1				
C27	ECUV1H182KBV	0.0018	1				
C28	ECUV1H181JCV	180P	1				
C29	ECUV1C473KBV	0.047	1				
C30	ECUV1H103KBV	0.01	1				
C32	ECUV1C104ZFV	0.1	1				
C34	ECUV1H560GCV	56P	1				
C35	ECUV1H560GCV	56P	1				
C36	ECUV1H560GCV	56P	1				
C39	ECUV1H223KBV	0.022	S 1				
C40	ECUV1H222KBV	0.0022	1				
C41	ECEA1HKS010	1	1				
C42	ECUV1H221JCV	220P	1				
C43	ECUV1H223KBV	0.022	S 1				
C45	ECUV1H102KBV	0.001	1				
C46	ECUV1H102KBV	0.001	1				
C47	ECUV1H102KBV	0.001	1				
C48	ECUV1C104ZFV	0.1	S 1				
C49	ECUV1H103KBV	0.01	1				
C50	ECUV1C104KBV	0.1	1				
C52	ECUV1C104KBV	0.1	1				
C53	ECUV1H820JCV	82P	1				
C101	ECUV1H330JCV	33P	1				
C104	ECUV1H220JCV	22P	1				
C105	ECUV1H103KBV	0.01	S 1				
C106	ECUV1H680JCV	68P	1				
C107	ECUV1H470JCV	47P	1				
C111	ECUV1H220JCV	22P	S 1				
C112	ECUV1H100DCV	10P	1				
C113	ECUV1H150JCV	15P	1				
C114	ECUV1H102KBV	0.001	S 1				
C115	ECUV1H103KBV	0.01	1				
C116	ECUV1C104ZFV	0.1	1				
C117	ECUV1H151JCV	150P	1				
C118	ECUV1H3R0BCV	3	1				

### KX-TCM416SAB

Ref. No.	Part No.	Part Name & Description	Pcs/Set
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### ACCESSORIES AND PACKING MATERIALS

A1	KX-A11BS1FL1	AC ADAPTOR	AS 1
A2	PQJA10075Z	TEL CORD	1
A3	PQKL10028Z2	STAND	S 1
A4	PQQX12068Z	INSTRUCTION BOOK	1
A5	PQQT11564Z	TEL CARD LABEL	1
P1	XZB11X40A02	PROTECTION COVER (for Handset)	1
P2	PQPH89Y	PROTECTION COVER (for Base Unit)	1
P3	PQPD10405Z	CUSHION	1
P4	PQPD10414Z	CUSHION	1
P5	PQPK12713Z	GIFT BOX	1
P6	PQPN10627Y	CUSHION	1

### TOOL

ZZ1	PQZZ12K11Z	EXTENSION CORD, 12P	1
<b>Note:</b> PQZZ12K11Z is useful for servicing (It make servicing easy).			

H (Q)  
KXTCM416SAB-L4  
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